CBO

Trends in the Distribution of Household Income Between 1979 and 2007

1979

2007

70

60

50

40

30

20

10

0

Lowest
Quintile

Second
Quintile

Middle
Quintile

Fourth
Quintile

Highest
Quintile

Shares of Income After Transfers and Federal Taxes, 1979 and 2007

OCTOBER 2011

A
CBO
STUDY

Trends in the Distribution of Household Income Between 1979 and 2007

October 2011

The Congress of the United States ■ Congressional Budget Office

Notes and Definitions

Numbers in the text, tables, and figures may not add up to totals because of rounding.

Unless otherwise indicated, all years referred to in this study are calendar years.

Some of the figures have shaded vertical bars that indicate the duration of recessions. (A recession extends from the peak of a business cycle to its trough.)

Income is adjusted for inflation using the Bureau of Labor Statistics' research series of the consumer price index for all urban consumers (CPI-U-RS).

Income is adjusted for differences in household size—specifically, by dividing income by the square root of a household's size. (A household consists of the people who share a housing unit, regardless of their relationships.)

Income categories are defined by ranking all households by their size-adjusted income. Percentiles (hundredths) and quintiles (fifths) contain equal numbers of people. Households with negative income are excluded from the lowest income category but are included in totals.

A household with children has at least one member under age 18. An elderly childless household is headed by a person age 65 or older with no member under age 18. A nonelderly childless household is one headed by a person under age 65 and with no member under age 18.

Market income includes the following components:

- Labor income, which includes cash wages and salaries (including those allocated by employees to 401(k) plans), employer-paid health insurance premiums, and the employer's share of Social Security, Medicare, and federal unemployment insurance payroll taxes.

- Business income, which includes net income from businesses and farms operated solely by their owners, partnership income, and income from S corporations.

- Capital gains, which are profits realized from the sale of assets. Increases in the value of assets that have not been realized through sales are not included in market income.

- Capital income (excluding capital gains) comprises taxable and tax-exempt interest, dividends paid by corporations (but not dividends from S corporations, which are considered part of business income), positive rental income, and corporate income taxes. Capital gains are considered separately and not included in this measure of capital income. The Congressional Budget Office assumes in this analysis that corporate income taxes are borne by owners of capital in proportion to their income from capital; therefore, the amount of the corporate tax is included in household income measured before taxes.

- Other income, which includes income received in retirement for past services and any other sources of income.

Transfer income includes cash payments from Social Security, unemployment insurance, Supplemental Security Income, Aid to Families with Dependent Children, Temporary Assistance for Needy Families, veterans' benefits, workers' compensation, and state and local government assistance programs, as well as the value of in-kind benefits, including food stamps, school lunches and breakfasts, housing assistance, energy assistance, Medicare, Medicaid, and the Children's Health Insurance Program (health benefits are measured as the fungible value, a Census Bureau estimate of the value to recipients).

After-tax income is equal to market income plus transfer income minus federal taxes paid. In assessing the impact of various taxes, individual income taxes are allocated directly to households paying those taxes. Social insurance, or payroll, taxes are allocated to households paying those taxes directly or paying them indirectly through their employers. Corporate income taxes are allocated to households according to their share of capital income. Federal excise taxes are allocated to households according to their consumption of the taxed good or service.

Average tax rates are calculated by dividing federal taxes paid by the sum of market income and transfer income. Negative tax rates result when refundable tax credits, such as the earned income and child tax credits, exceed the other taxes owed by people in an income group. (Refundable tax credits are not limited to the amount of income tax owed before they are applied.)

The **Gini index** is a summary measure of income inequality based on the relationship between shares of income and shares of the population. It ranges in value from zero to one, with zero indicating complete equality (for example, if each fifth of the population, ranked by income, received one-fifth of total income) and one indicating complete inequality (for example, if one household received all the income). A Gini index that increases over time indicates rising income dispersion.

A **concentration index** is a measure similar to a Gini coefficient and is used in this study to express the inequality of market income from different sources. The index differs from a Gini index for an income source because in calculating the concentration index, households are ranked by total market income rather than by income from that source, as they would be in calculating the Gini index for that income source.
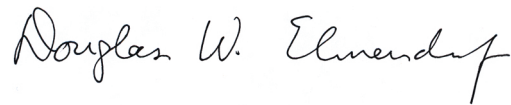
Preface

This Congressional Budget Office (CBO) study—prepared at the request of the Chairman and former Ranking Member of the Senate Committee on Finance—documents changes in the distribution of household income between 1979 and 2007. CBO's analysis examines the distribution of household income before and after government transfers and federal taxes, and it reports the contribution of various income components (such as wages and salaries, capital income, and business income) to the distribution of market income. The study presents information on trends in the distribution of income for all households combined and for households separated on the basis of age and the presence of children. In keeping with CBO's mandate to provide objective, impartial analysis, this study makes no recommendations.

Douglas W. Elmendorf
Director

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Summary

From 1979 to 2007, real (inflation-adjusted) average household income, measured after government transfers and federal taxes, grew by 62 percent. During that period, the evolution of the nation's economy and the tax and spending policies of the federal government and state and local governments had varying effects on households at different points in the income distribution: Income after transfers and federal taxes (denoted as after-tax income in this study) for households at the higher end of the income scale rose much more rapidly than income for households in the middle and at the lower end of the income scale.[1] In particular:

■ For the 1 percent of the population with the highest income, average real after-tax household income grew by 275 percent between 1979 and 2007 (see Summary Figure 1).

■ For others in the 20 percent of the population with the highest income (those in the 81st through 99th percentiles), average real after-tax household income grew by 65 percent over that period, much faster than it did for the remaining 80 percent of the population, but not nearly as fast as for the top 1 percent.

■ For the 60 percent of the population in the middle of the income scale (the 21st through 80th percentiles), the growth in average real after-tax household income was just under 40 percent.

■ For the 20 percent of the population with the lowest income, average real after-tax household income was about 18 percent higher in 2007 than it had been in 1979.

As a result of that uneven income growth, the distribution of after-tax household income in the United States was substantially more unequal in 2007 than in 1979: The share of income accruing to higher-income households increased, whereas the share accruing to other households declined. In fact, between 2005 and 2007, the after-tax income received by the 20 percent of the population with the highest income exceeded the after-tax income of the remaining 80 percent.

To assess trends in the distribution of household income, the Congressional Budget Office (CBO) examined the span from 1979 to 2007 because those endpoints allow comparisons between periods of similar overall economic activity (they were both years before recessions). The growth in average income for different groups over the 1979–2007 period reflects a comparison of average income for those groups at different points in time; it does not reflect the experience of particular households. Individual households may have moved up or down the income scale if their income rose or fell more than the average for their initial group. Thus, the population with income in the lowest 20 percent in 2007 was not necessarily the same as the population in that category in 1979.

Increased Concentration of Market Income

The major reason for the growing unevenness in the distribution of after-tax income was an increase in the concentration of market income (income measured

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1. For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study. All measures of household income are adjusted to account for differences in household size. Appendix A provides a more detailed discussion of the methodology.

Summary Figure 1.

Growth in Real After-Tax Income from 1979 to 2007

(Percent)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see ''Notes and Definitions'' at the beginning of this study.

before government transfers and taxes) in favor of higher-income households; that is, such households' share of market income was greater in 2007 than in 1979. Specifically, over that period, the highest income quintile's share of market income increased from 50 percent to 60 percent (see Summary Figure 2). The share of market income for every other quintile declined. (Each quintile contains one-fifth of the population, ranked by adjusted household income.) In fact, the distribution of market income became more unequal almost continuously between 1979 and 2007 except during the recessions in 1990–1991 and 2001.

Two factors accounted for the changing distribution of market income. One was an increase in the concentration of each source of market income, which consists of labor income (such as cash wages and salaries and employer-paid health insurance premiums), business income, capital gains, capital income, and other income. All of those sources of market income were less evenly distributed in 2007 than they were in 1979.

The other factor leading to an increased concentration of market income was a shift in the composition of that

income. Labor income has been more evenly distributed than capital and business income, and both capital income and business income have been more evenly distributed than capital gains. Between 1979 and 2007, the share of income coming from capital gains and business income increased, while the share coming from labor income and capital income decreased.

Those two factors were responsible in varying degrees for the increase in income concentration over different portions of the 1979–2007 period. In the early years of the period, market income concentration increased almost exclusively as a result of an increasing concentration of separate income sources. The increased concentration of labor income alone accounted for more than 90 percent of the increase in the concentration of market income in those years. In the middle years of the period, an increase in the concentration within each income source accounted for about one-half of the overall increase in market income concentration; a shift to more-concentrated sources explains the other half. In the later years, an increase in the share of total income from more highly concentrated sources, in this case capital gains, accounted for about four-fifths of the total increase in

Summary Figure 2.

Shares of Market Income, 1979 and 2007
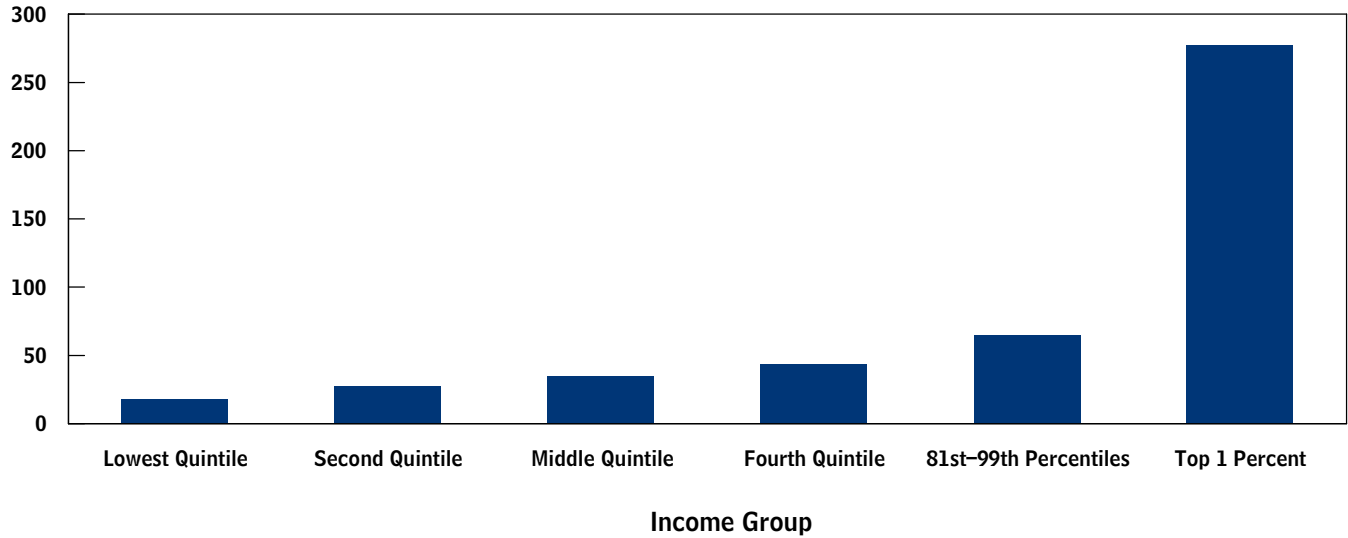
(Percent)
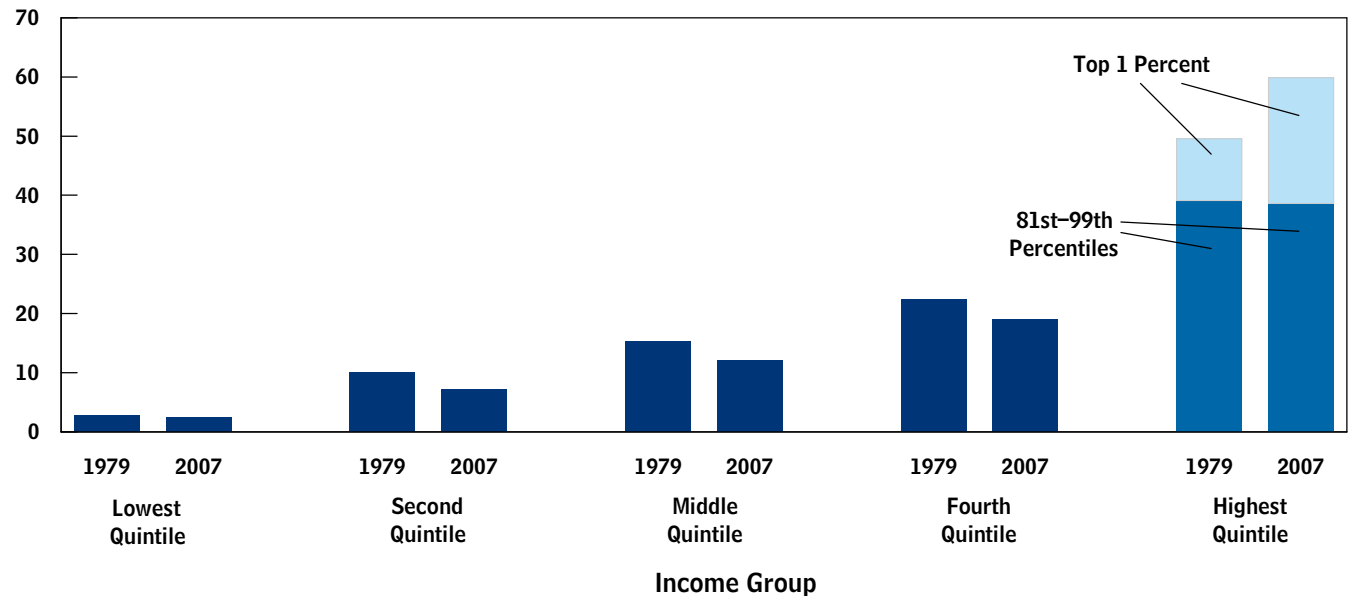
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

concentration. Over the 1979–2007 period as a whole, an increasing concentration of each source of market income was the more significant factor, accounting for four-fifths of the increase in market income concentration.

Income at the Very Top of the Distribution

The rapid growth in average real household market income for the 1 percent of the population with the highest income was a major factor contributing to the growing inequality in the distribution of household income between 1979 and 2007. Average real household market income for the highest income group nearly tripled over that period, whereas market income increased by about 19 percent for a household at the midpoint of the income distribution. As a result of that uneven growth, the share of total market income received by the top 1 percent of the population more than doubled between 1979 and 2007, growing from about 10 percent

to more than 20 percent. Without that growth at the top of the distribution, income inequality still would have increased, but not by nearly as much. The precise reasons for the rapid growth in income at the top are not well understood, though researchers have offered several potential rationales, including technical innovations that have changed the labor market for superstars (such as actors, athletes, and musicians), changes in the governance and structure of executive compensation, increases in firms' size and complexity, and the increasing scale of financial-sector activities.

The composition of income for the 1 percent of the population with the highest income changed significantly from 1979 to 2007, as the shares from labor and business income increased and the share of income represented by capital income decreased. That pattern is consistent with a longer-term trend: Over the entire 20th century, labor income has become a larger share of income for high-income taxpayers, while capital income has declined as a share of their income.

The Role of Government Transfers and Federal Taxes

Although an increasing concentration of market income was the primary force behind growing inequality in the distribution of after-tax household income, shifts in government transfers (cash payments to individuals and estimates of the value of in-kind benefits) and federal taxes also contributed to that increase in inequality.[2] CBO estimates that the dispersion of market income grew by about one-quarter between 1979 and 2007, while the dispersion of after-tax income grew by about one-third.[3]

This study assesses the effects of transfers and taxes on the distribution of household income by examining the differences in the dispersion of income for three types of income:

■ Market income (before-transfer, before-tax income),

■ Market income plus government transfers (after-transfer, before-tax income), and

■ Market income plus government transfers minus federal taxes (after-transfer, after-federal-tax income)—called after-tax income in this study.

A proportional transfer and tax system would leave the dispersion of after-tax income equal to the dispersion of market income. Transfers that are a decreasing percentage of market income as income rises (progressive transfers) cause after-tax income to be less concentrated than market income, as do taxes that are an increasing percentage of before-tax household income as income rises (progressive taxes).

Transfers and taxes can also affect households' market income by creating incentives for people to change their behavior. If an additional dollar earned or saved leads to reductions in transfer payments or increases in taxes, then the after-tax return to working and saving is reduced,

which may cause people to work or save less. However, those changes in transfers and taxes also reduce after-transfer, after-tax income, which may cause people to work or save more. In this analysis, CBO did not adjust market income to account for those effects of transfers and taxes.

Because government transfers and federal taxes are both progressive, the distribution of after-transfer, after-federal-tax household income is more equal than is the distribution of market income. Specifically, the dispersion of after-tax income in 2007 was about four-fifths as large as the dispersion of market income. Of the difference in dispersion between market income and after-tax income, roughly 60 percent was attributable to transfers and roughly 40 percent was attributable to federal taxes.

The equalizing effect of transfers and taxes on household income was smaller in 2007 than it had been in 1979. The equalizing effect of transfers depends on their size relative to market income and their distribution across the income scale. The size of transfer payments—as measured in this study—rose by a small amount between 1979 and 2007. The distribution of transfers shifted, however, moving away from households in the lower part of the income scale. In 1979, households in the bottom quintile received more than 50 percent of transfer payments. In 2007, similar households received about 35 percent of transfers. That shift reflects the growth in spending for programs focused on the elderly population (such as Social Security and Medicare), in which benefits are not limited to low-income households. As a result, government transfers reduced the dispersion of household income by less in 2007 than in 1979.

Likewise, the equalizing effect of federal taxes depends on both the amount of federal taxes relative to income (the average tax rate) and the distribution of taxes among households at different income levels. Over the 1979–2007 period, the overall average federal tax rate fell by a small amount, the composition of federal revenues shifted away from progressive income taxes to less-progressive payroll taxes, and income taxes became slightly more concentrated at the higher end of the income scale. The effect of the first two factors outweighed the effect of the third, reducing the extent to which taxes lessened the dispersion of household income.

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2. This study does not include state and local taxes, an issue discussed in more detail in Appendix A.

3. In this study, CBO measured dispersion using the Gini index, which takes on the value of zero if income is equally distributed and increases as incomes become more unequal.

Summary Figure 3.

Shares of Income After Transfers and Federal Taxes, 1979 and 2007

(Percent)
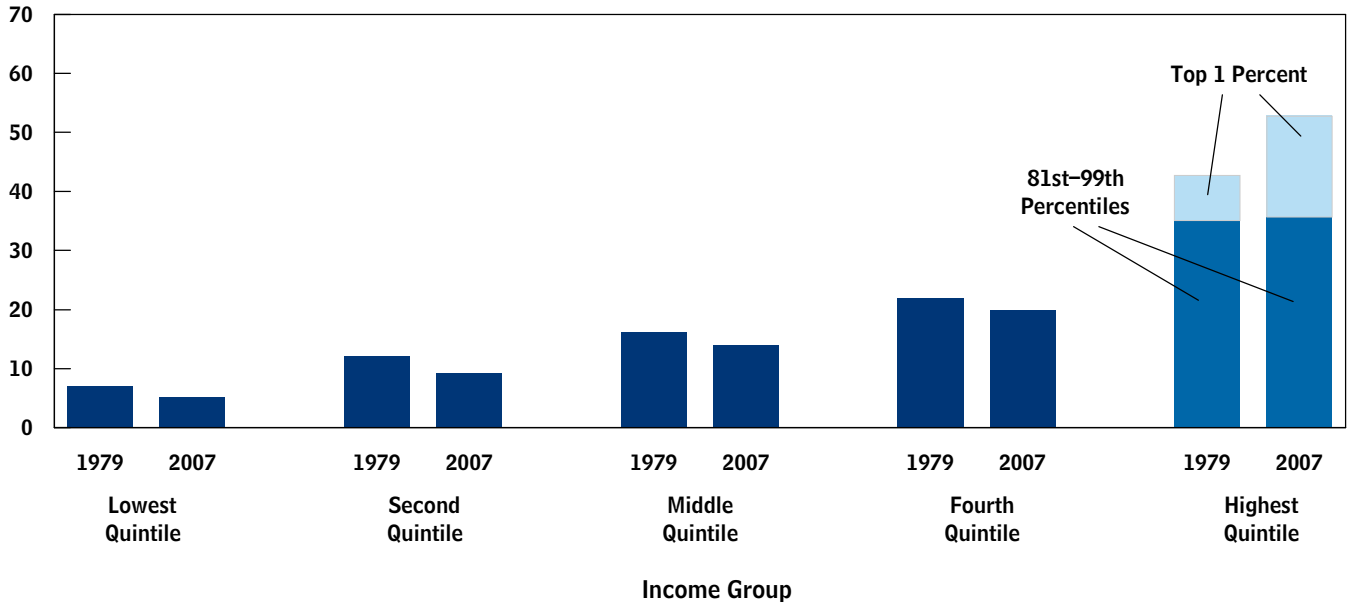
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Increased Concentration of After-Tax Income

As a result of those changes, the share of household income after transfers and federal taxes going to the highest income quintile grew from 43 percent in 1979 to 53 percent in 2007 (see Summary Figure 3). The share of after-tax household income for the 1 percent of the population with the highest income more than doubled,

climbing from nearly 8 percent in 1979 to 17 percent in 2007.

The population in the lowest income quintile received about 7 percent of after-tax income in 1979; by 2007, their share of after-tax income had fallen to about 5 percent. The middle three income quintiles all saw their shares of after-tax income decline by 2 to 3 percentage points between 1979 and 2007.

Trends in the Distribution of Household Income Between 1979 and 2007

Introduction

This Congressional Budget Office (CBO) analysis finds that, over the past three decades, the distribution of income in the United States has become increasingly dispersed—in particular, the share of income accruing to higher-income households has increased, whereas the share accruing to other households has declined. Despite definitional and methodological differences, other analyses using data from tax returns or surveys have reached similar conclusions.[1]

The dispersion of household income rose almost continually throughout the nearly 30-year period spanning 1979 through 2007 except during the 1990–1991 and 2001 recessions. The recent turmoil in financial markets, the prolonged recession that began in December 2007, and the ongoing slow recovery may have caused a pause in that upward trend, but the present analysis does not extend beyond 2007.[2]

Other developed economies have experienced a similar long-term trend toward greater dispersion in household income. A recent report covering the 30 developed countries of the Organization for Economic Cooperation and Development (OECD) concluded, "Overall, over the entire period from the mid-1980s to the mid-2000s, the dominant pattern is one of a fairly widespread increase in inequality (in two-thirds of all countries) . . . The rises are stronger in Finland, Norway and Sweden (from a low base) as well as Germany, Italy, New Zealand and the United States (from a higher base)."[3]

The growing dispersion of household income over the past three decades follows a lengthy period in which income concentration was little changed. Economists Thomas Piketty and Emmanuel Saez used data from tax returns to examine income concentration in the United States over the past 90 years. They found that income concentration dropped dramatically following World War I and World War II, remained roughly unchanged for the next few decades, and then rose starting in 1975, reaching pre–World War I levels by 2000.[4]

CBO's Analysis

In this analysis, CBO examines the trends in the distribution of household income from 1979 through 2007. Using data from the Internal Revenue Service (IRS) and survey data collected by the Census Bureau, CBO estimated income after government transfer payments and

1. Arthur F. Jones Jr. and Daniel H. Weinberg, *The Changing Shape of the Nation's Income Distribution, 1974–1998,* Current Population Reports, Series P60-204 (Bureau of the Census, June 2000); and Michael Strudler and others, *Analysis of the Distribution of Income, Taxes, and Payroll Taxes via Cross Section and Panel Data, 1979–2004* (Internal Revenue Service, Statistics of Income Division, 2006).

2. Tabulations of tax returns from the Internal Revenue Service show that high-income taxpayers had especially large declines in adjusted gross income between 2007 and 2009. However, evidence based solely on survey data from the Census Bureau shows some increase in income dispersion between 2007 and 2009. (See Internal Revenue Service, *Statistics of Income—Individual Income Tax Returns*, for 2007, 2008 and 2009; and U.S. Census Bureau, Current Population Survey, 1968 to 2010 Annual Social and Economic Supplements, "Selected Measures of Household Income Dispersion: 1967 to 2009," www.census.gov/hhes/www/income/data/historical/inequality/taba2.pdf.)

3. Organization for Economic Cooperation and Development, *Growing Unequal? Income Distribution and Poverty in OECD Countries* (2008).

4. Thomas Piketty and Emmanuel Saez, "Income Inequality in the United States, 1913–1998," *Quarterly Journal of Economics*, vol. 118, no. 1 (February 2003), pp. 1–39.

Figure 1.

Cumulative Growth in Mean and Median Household After-Tax Income

(Percentage change in income since 1979, adjusted for inflation)
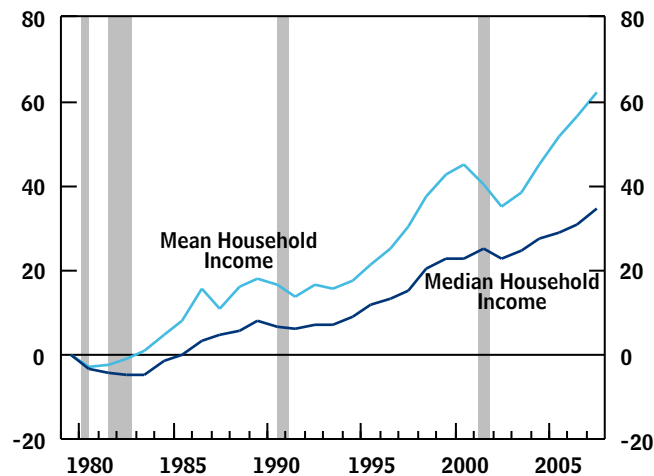
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

federal taxes for a representative sample of households in each year during that period. (Appendix A contains a more detailed discussion of the data and methodology.) CBO analyzed the trend in the dispersion of households' after-transfer, after-federal-tax income (in this study, labeled "after-tax income") and the extent to which transfers and federal taxes mitigated the dispersion of before-transfer, before-tax income (in this report, labeled "market income"). The analysis examines the contribution of various components of income—such as wages and salaries, capital income, and business income—to the distribution of market income and considers the effects of increases in women's participation in the labor force and women's earnings. It presents information on the trends in the distribution of income for all households combined and for households separated on the basis of age and the presence of children.

The beginning and end points of the analysis, 1979 and 2007, were similar years in terms of overall economic activity; both were economic peak years just prior to a recession.[5] Moreover, as a practical matter, 1979 is the

earliest year for which the Census Bureau provides consistent estimates for some measures of income.

CBO focuses on annual income measures in this analysis, comparing average income at different points in time for different households grouped by income or household type. However, many households represented in those averages experienced growth or declines in income that differed from the average experience for their initial group, and the households in any particular segment of the income distribution in 2007 were not necessarily the same households that were in that segment in 1979. The analysis does not assess trends in the distribution of other measures of economic well-being, such as household income measured over a longer period, household consumption, or household wealth (see Box 1 on page 4).

Increased Dispersion of Households' After-Tax Income

Real (inflation-adjusted) *mean* household income, measured after government transfers and federal taxes, grew by 62 percent between 1979 and 2007. Over the same period, real *median* after-tax household income (half of all households have income below the median, and half have income above it) grew by 35 percent (see Figure 1). Because the mean (or average) can be heavily influenced by very high or very low incomes, the large gap between mean and median income growth signals a pattern of growth that was heavily weighted toward households with income well above the median.

Uneven Growth in After-Tax Income

The distribution of after-tax income (including government transfer payments) became substantially more unequal from 1979 to 2007 as a result of a rapid rise in income for the highest-income households, sluggish income growth for the middle 60 percent of the population, and an even smaller increase in after-tax income for the 20 percent of the population with the lowest income.[6]

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5.   The recession in 1980 officially began in January 1980, and the most recent recession began in December 2007.

6.   Households are ranked by income that is adjusted for household size by dividing income by the square root of a household's size. Each fifth of the population (quintile) contains an equal number of people, but because households vary in size, quintiles generally contain unequal numbers of households. (See Appendix A for the income ranges for each quintile.)

Figure 2.

Cumulative Growth in Average After-Tax Income, by Income Group

(Percentage change in income since 1979, adjusted for inflation)
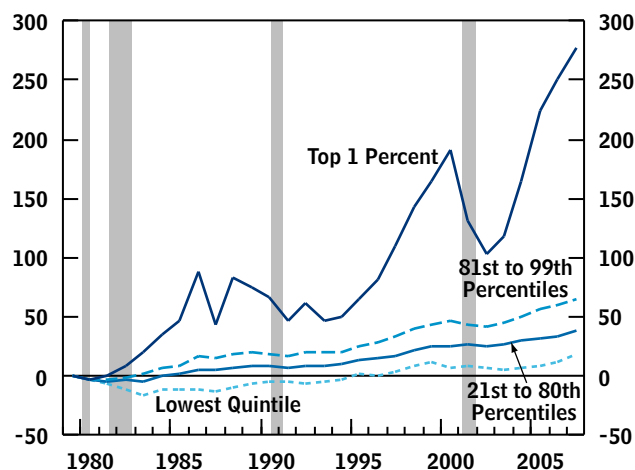
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Average real after-tax household income for the 1 percent of the population with the highest income grew by 275 percent between 1979 and 2007 (see Figure 2). Average real after-tax income for that group has been quite volatile: It spiked in 1986 and fell in 1987, reflecting an acceleration of capital gains realizations into 1986 in anticipation of the scheduled increase in tax rates the following year. Income growth for the top 1 percent of the population rebounded in 1988 but fell again with the onset of the 1990–1991 recession. By 1994, after-tax household income was 50 percent higher than it had been in 1979. Income growth surged in 1995, averaging more than 11 percent per year through 2000. After falling sharply in 2001 because of the recession and stock market drop, average real after-tax income for the top 1 percent of the population rose by more than 85 percent between 2002 and 2007. (The turmoil in financial markets in 2008 probably reversed some of that growth, but it is not clear by how much or for how long.)

For other households in the highest-income quintile (the 81st through 99th percentiles), average after-tax income grew by 65 percent between 1979 and 2007. That

growth was not nearly as great as for the top 1 percent of the population, although it was much greater than for most other households.

For the 60 percent of the population in the middle of the income scale (the 21st through 80th percentiles), average after-tax household income grew 37 percent between 1979 and 2007. Income for those households grew in most years starting after 1983, with the exception of 1990–1991 and 2002.

Average after-tax household income in the lowest income quintile (the 1st through 20th percentiles) was 18 percent higher in 2007 than in 1979. After-tax income for that quintile dropped sharply during the 1980 and 1981–1982 recessions; by 1983, that income was 15 percent lower than it had been in 1979, and it did not rebound to its 1979 level until 1995, some 16 years later. Average after-tax income for the lowest income quintile peaked in 1999, fell through 2003, and then began to rise again in 2004, climbing steadily through 2007.

The Resulting Shift in Income Shares

As a result of that uneven income growth, the share of total after-tax income received by the 1 percent of the population in households with the highest income more than doubled between 1979 and 2007, whereas the share received by low- and middle-income households declined (see Figure 3 on page 6). The share of income received by the top 1 percent grew from about 8 percent in 1979 to over 17 percent in 2007. The share received by other households in the highest income quintile was fairly flat over the same period, edging up from 35 percent to 36 percent. In contrast, the share of after-tax income received by the 60 percent of the population in the three middle-income quintiles fell by 7 percentage points between 1979 and 2007, from 50 percent to 43 percent of total after-tax household income, and the share of after-tax income accruing to the lowest-income quintile decreased from 7 percent to 5 percent. By 2005, the share of total after-tax household income received by the 20 percent of the population with the highest income had exceeded the share received by the remaining 80 percent. In 2007, those shares were 53 percent and 47 percent, respectively. In 1979, the top 1 percent received about the same share of income as the lowest income quintile; by 2007, the top percentile received more than the lowest two income quintiles combined.

Box 1.

Measures of Economic Well-Being

Because annual income is only one measure of economic well-being, trends in the distribution of annual income may provide an incomplete picture of trends in the distribution of well-being. For example, a household's income in any given year may not accurately represent its economic circumstances over a longer period. Average income over multiple years, even over a lifetime, might be a better indicator of a household's economic well-being.

Likewise, a household's consumption might be a better measure of its economic well-being than its income is. For households whose spending tracks their annual income, the distinction does not matter. But a young family may spend more than its current income, relying on borrowing to finance current consumption, while an older family may also spend more than its current income, drawing down assets in retirement. In contrast, a household in its middle years may spend less than its current income while saving for future needs.

The ability of households to smooth their consumption over time by borrowing and saving suggests that household wealth might provide another useful perspective on economic well-being. Households may finance consumption directly from accumulated wealth by drawing down assets or by borrowing with those assets as collateral. In addition, some forms of wealth, such as owner-occupied housing, provide a service to owners that is often not measured as part of annual income.

Those alternative measures of economic well-being—household income measured over a longer time, household consumption, and household wealth—are distributed across households in different ways than annual income is. Moreover, the distributions of those measures may have evolved in different ways than has the distribution of households' annual income over the past three decades.

Household income measured over a multiyear period is more equally distributed than income measured over one year, although only modestly so. Given the fairly substantial movement of households across income groups over time, it might seem that income measured over a number of years should be significantly more equally distributed than income measured over one year. However, much of the movement of households involves changes in income

Increased Dispersion of Households' Market Income

An increase in the dispersion of household market income was the major reason for the widening dispersion of household after-tax income. Market income is measured before adding transfer payments and subtracting federal taxes and consists of labor income (such as cash wages and salaries and employer-paid health insurance premiums), business income, capital gains, capital income, and other income. Real average market income grew by 58 percent between 1979 and 2007 (similar to the 62 percent change in average after-tax income), but median market income grew by only 19 percent (less than the 35 percent growth in median after-tax income; see Figure 4 on page 6).

Measuring Income Dispersion

Various summary measures of income dispersion condense data for the entire distribution of household income into a single number. One such measure, the Gini index, is based on the relationship between shares of income and shares of the population (see Box 2 on page 8). That index ranges in value from zero to one, with zero indicating complete equality (for example, if each percentile of the population, ranked by income, received 1 percent of total income) and one indicating complete inequality (for example, if one household received all the income). A Gini index for household income that increases over time indicates rising inequality of household income.

Box 1.   **Continued**

Measures of Economic Well-Being

that are large enough to push households into differ-ent income groups but not large enough to greatly affect the overall distribution of income. Multiyear income measures also show the same pattern of increasing inequality over time as is observed in annual measures.[1]

Household consumption is more equally distributed than household income. Trends in the concentration of household consumption are mixed. Inequality in consumption appears to have increased during the 1980s but not in the 1990s.[2] However, data on the consumption of U.S. households do not adequately capture consumption by high-income households, a group whose rising income accounts for much of the observed increase in annual income inequality.

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1. Congressional Budget Office, *Effective Tax Rates: Comparing Annual and Multiyear Measures* (January 2005); and Wojciech Kopczuk, Emmanuel Saez, and Jae Song, "Earnings Inequality and Mobility in the United States: Evidence from Social Security Data Since 1937," *Quarterly Journal of Economics,* vol. 125, no. 1 (February 2010), pp. 91–128.

Household wealth is much more unequally distributed than household income or household consumption. The distribution of household wealth appears to have become more unequal from 1983 to 1989 but to have remained relatively unchanged from 1989 through 2007.[3]

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2. For further discussion, see David M. Cutler and Lawrence F. Katz, "Rising Inequality? Changes in the Distribution of Income and Consumption in the 1980s," *American Economic Review*, vol. 82, no. 2 (1992), pp. 546–551; David S. Johnson, Timothy M. Smeeding, and Barbara Boyle Torrey, "Economic Inequality Through the Prisms of Income and Consumption," *Monthly Labor Review*, vol. 128, no. 4 (2005), pp. 11–24; and Dirk Krueger and Fabrizio Perri, "Does Income Inequality Lead to Consumption Inequality? Evidence and Theory," *Review of Economic Studies*, vol. 73, no. 1 (2006), pp. 163–193.

3. For further discussion, see Wojciech Kopczuk and Emmanuel Saez, "Top Wealth Shares in the United States, 1916–2000: Evidence from Estate Tax Returns," *National Tax Journal*, vol. 57, no. 2, part 2 (2004), pp. 445–488.

The Gini index for household market income rose from 0.479 in 1979 to 0.590 by 2007, an increase of 23 percent (see Figure 5 on page 7).[7] The index increased almost continuously during that span except for declines during the recessions in 1990–1991 and 2001. The rate of increase was not constant, however. The Gini index increased at a rate of about 1¼ percent per year from 1979 through 1988, at about 1 percent per year from 1991 through 2000, and at a 2 percent annual rate from 2002 through 2005; it changed little from 2005 through 2007.

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7. As a point of comparison, by one calculation the Gini index for the United States in the mid-2000s was about 23 percent above the average for all OECD countries and about 23 percent below the index for Mexico, the OECD country with the highest index. See Organization for Economic Cooperation and Development, *Growing Unequal? Income Distribution and Poverty in OECD Countries.*

The Gini index also can be described another way, as half of the average difference in income between every pair of households in the population, expressed as a percentage of average income. From that perspective, a Gini index of 0.479 in 1979 implies that the average income difference between pairs of households in that year was equal to 96 percent (twice 0.479) of average household market income, or about $34,500 (measured in constant 2007 dollars and adjusted for differences in household size). Similarly, a Gini index of 0.590 in 2007 implies that the average difference between pairs of households was 118 percent (twice 0.590) of average household market income in that year, or about $66,600 (with a similar adjustment for household size).

Some of the transitory changes in the Gini index reflect the volatile nature of income from capital gains. Capital gains ranged from about 3 percent to 5 percent of market income in most years, but they spiked to over 10 percent

in 1986 and nearly 9 percent in 2000. The spike in 1986 reflected the rush to realize profits from increases in asset prices in anticipation of the tax-rate increase scheduled to take effect in 1987. The peak in 2000 was the culmination of five years of growing realizations reflecting the run-up in stock market prices from 1995 through 2000. Realized gains peaked again in 2007, at 9 percent of market income.

Removing capital gains from before-transfer, before-tax income smoothes out some of the jumps in the Gini measure but does not change the trend (see Figure 5). The Gini index for market income excluding capital gains increased from 0.464 to 0.562 between 1979 and 2007. That increase of more than 21 percent was nearly as large as the 23 percent increase in the Gini index for household income including capital gains.

Comparison with Other Estimates

Other researchers have reached similar conclusions about the trends in income inequality. In an influential paper, economists Thomas Piketty and Emmanuel Saez found

Figure 3.

Share of Total After-Tax Income, by Income Group
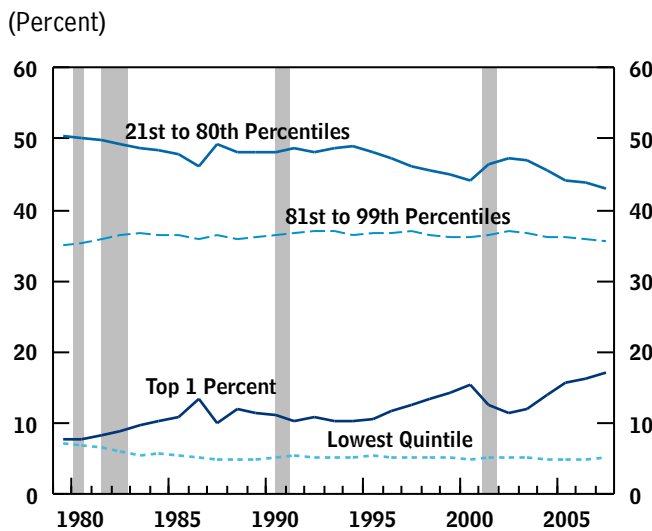
(Percent)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Figure 4.

Cumulative Growth in Mean and Median Household Market Income

(Percentage change in income since 1979, adjusted for inflation)
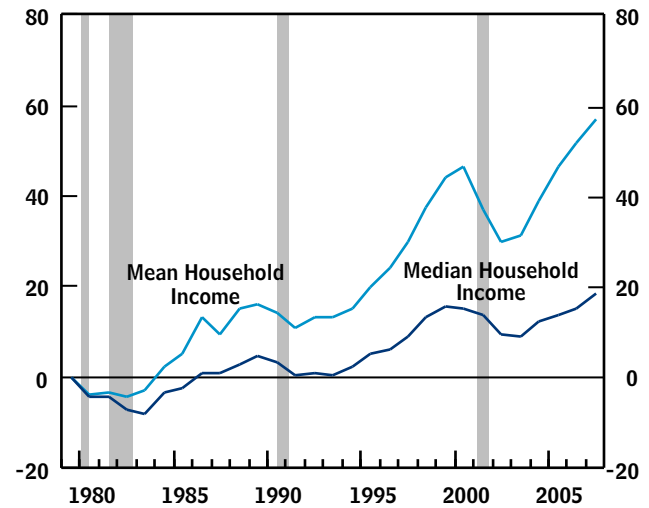
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

that income concentration began to rise in the late 1970s and continued to grow thereafter. They found especially dramatic increases within the top percentile of the income distribution.[8] Their analysis is based on published tax return statistics, and it uses a market-income definition. The key advantage of those data, as well as the data used in this analysis, is that they are comprehensive at the top of the income distribution, where much of the change in the income distribution has occurred. One drawback of tax return data alone, however, is that they only cover the portion of the population filing tax returns, so they cannot yield distributional statistics for the full population. In addition, they cannot capture income that is not reported on tax returns.

Census Bureau statistics also show an increase in inequality, although those statistics—which do not measure income for the highest-income households nearly as well as tax return data—imply both a smaller degree of

8.   See Piketty and Saez, "Income Inequality in the United States," and updated tables at www.econ.berkeley.edu/~saez/.

Figure 5.

Summary Measures of Market Income Inequality, With and Without Capital Gains

(Gini index)
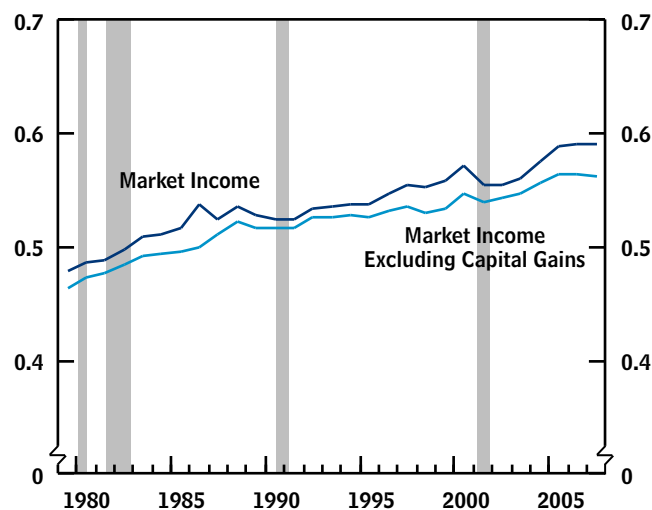
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

inequality and a smaller increase in inequality than were found in CBO's analysis. As computed by the Census Bureau, the Gini index for household money income— a before-tax income measure that includes some government transfers—rose from 0.403 in 1979 to 0.463 in 2007, an increase of 15 percent.[9] The Gini indexes for alternative measures of income (as computed by the Census Bureau) show comparable increases.

Economist Richard Burkhauser and his coauthors, using internal Census Bureau data, found that the rate of increase in inequality has slowed substantially since the mid-1990s.[10] They computed Gini indexes using a before-tax, after-transfer measure of household cash

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9.   Carmen DeNavas-Walt, Bernadette D. Proctor, and Jessica C. Smith, *Income, Poverty, and Health Insurance Coverage in the United States: 2009,* Current Population Reports, Series P60-238 (Bureau of the Census, September 2010).

10.   Richard Burkhauser and others, *Estimating Trends in US Income Inequality Using the Current Population Survey: The Importance of Controlling for Censoring,* Working Paper 14247 (Cambridge, Mass.: National Bureau of Economic Research, August 2008).

income, excluding capital gains, which was adjusted for differences in household size using the square root of household size. They found that the Gini index grew at an annual rate of 0.14 percent after 1993, in contrast to a growth rate of 0.74 percent in the 1975–1992 period.

Burkhauser and his coauthors also compared the trends in top income shares with those reported by Piketty and Saez and found that the measures from the two data sources align well, except for measures for the top percentile of the income distribution. Even though Burkhauser and his coauthors found little increase in income inequality after 1993, their analysis did not reject the possibility that inequality could have increased among the highest-income households, so they concluded that their results were not inconsistent with those of Piketty and Saez. An increase among the highest-income households may explain the slower growth in measured income inequality in more recent years in the Census Bureau's data.

Why Did Market Income Become Less Equally Distributed?

The market income of households can become more unequally distributed over time if individual components of income become more highly concentrated or if the composition of income shifts so that a greater share of total income comes from components that are more highly concentrated.

Over the 1979–2007 period, the first of those factors was the primary reason overall market income became less evenly distributed: All major sources of market income became more highly concentrated in favor of higher-income households. Labor income was the biggest contributor because it is by far the largest source of income, even though the increase in the concentration of labor income was smaller than the increase in concentration for other sources.

A shift in the composition of income also contributed to the growing concentration. A decrease in the share of total market income from wages and other labor compensation and an increase in the share from capital gains contributed to the increase in market income inequality because capital gains are much more concentrated among higher-income households than is labor income.

Box 2.

Calculating and Interpreting the Gini Index

Income and Population Shares, 2007

(Percent)

Income Group	Population		Market Income		After-Tax Income (Income After Transfers and Federal Taxes)	
	Share	Cumulative Share	Share	Cumulative Share	Share	Cumulative Share
Lowest Quintile	20	20	2	2	4	4
Second Quintile	20	40	7	9	9	13
Middle Quintile	20	60	12	21	14	27
Fourth Quintile	20	80	19	40	20	47
81st–90th Percentiles	10	90	14	55	14	61
91st–95th Percentiles	5	95	10	65	10	71
96th–99th Percentiles	4	99	14	79	12	83
Top 1 Percent	1	100	21	100	17	100

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

The Gini index is a widely used measure of income inequality. It ranges from zero to one, with higher values implying greater inequality. The index provides a useful summary metric of the entire income distribution by characterizing it with a single number, but interpreting the value of the index may not be intuitive.

The Gini index can be estimated directly from data on the shares of income accruing to various groups.[1] The first step in computing the index is to array the groups in order from lowest to highest income and to calculate the share of income earned by each group. Consider the distribution of market income (defined here as income before transfers and taxes) in 2007. The lowest quintile (or one-fifth of the population) earned 2 percent of market income; the second,

middle, and fourth quintiles earned 7 percent, 12 percent, and 19 percent, respectively; and the remaining 60 percent of market income was divided among the subgroups of the top quintile (see the table).

The distribution of income after transfers and federal taxes (labeled after-tax income) was more equal than was the distribution of market income. Each of the bottom four quintiles (ranked by after-tax income) received a share of after-tax income that was 1 or 2 percentage points higher than its share of market income, while the highest quintile's share of after-tax income was 6 percentage points lower than its share of market income.

The next step in calculating the index is to compute the cumulative share of income earned by each group and all of the groups with lower income. The first and second quintiles—cumulatively, the bottom 40 percent of the population—received a combined

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1.   To calculate the Gini indexes in the primary analysis, the Congressional Budget Office applied this approach to disaggregated data, yielding a more precise estimate of the Gini index than do calculations based on grouped data.

Continued

Box 2.   **Continued**

Calculating and Interpreting the Gini Index
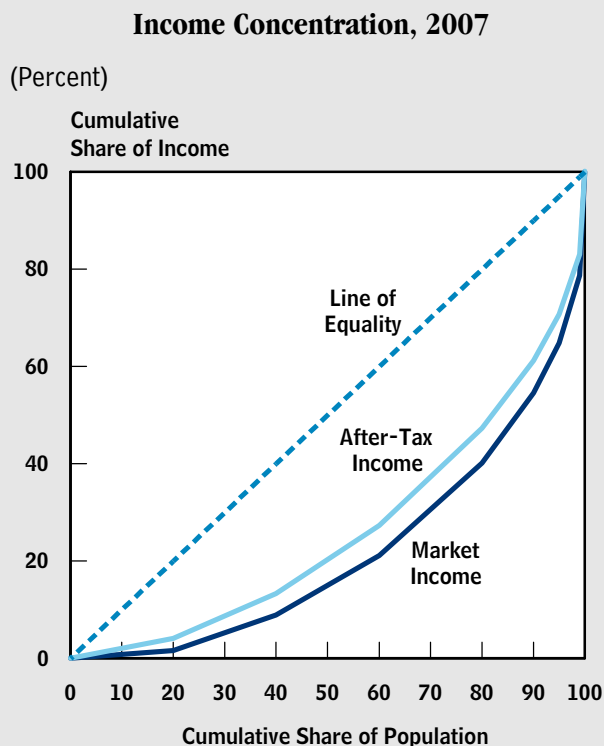
Income Concentration, 2007

(Percent)

Cumulative
Share of Income

Source: Congressional Budget Office.

Notes: For information on income definitions, the ranking of
households, the allocation of taxes, and the construc-
tion of inequality indexes, see "Notes and Definitions"
at the beginning of this study.

The line of equality shows what the distribution would
be if each income group had equal income.

9 percent of market income and 13 percent of after-
tax income. Adding the middle quintile shows that
the bottom 60 percent of the population received
21 percent of market income and 27 percent of after-
tax income.

The cumulative percentage of income can be plotted
against the cumulative percentage of the population,
producing a so-called Lorenz curve (see the figure).

The more even the income distribution is, the closer
to a 45-degree line the Lorenz curve is. At one
extreme, if each income group had the same income,
then the cumulative income share would equal the
cumulative population share, and the Lorenz curve
would follow the 45-degree line, known as the line of
equality. At the other extreme, if the highest income
group earned all the income, the Lorenz curve would
be flat across the vast majority of the income range,
following the bottom edge of the figure, and then
jump to the top of the figure at the very right-hand
edge.

Lorenz curves for actual income distributions fall
between those two hypothetical extremes. Typically,
they intersect the diagonal line only at the very first
and last points. Between those points, the curves are
bow-shaped below the 45-degree line. The Lorenz
curve of market income falls to the right and below
the curve for after-tax income, reflecting its greater
inequality. Both curves fall to the right and below the
line of equality, reflecting the inequality in both mar-
ket income and after-tax income.

The Gini index is equal to twice the area between the
45-degree line and the Lorenz curve. Once again, the
extreme cases of complete equality and complete
inequality bound the measure. At one extreme, if
income was evenly distributed and the Lorenz curve
followed the 45-degree line, there would be no area
between the curve and the line, so the Gini index
would be zero. At the other extreme, if all income was
in the highest income group, the area between the
line and the curve would be equal to the entire area
under the line, and the Gini index would equal one.
The Gini index for after-tax income in 2007 was
0.489—about halfway between those two extremes.

Sources of Income. For this analysis, CBO divided market income into the following components:

- *Labor income:* Cash wages and salaries (including those allocated by employees to 401(k) plans), employer-paid health insurance premiums, and the employer's share of Social Security, Medicare, and federal unemployment insurance payroll taxes. CBO assumes in this analysis that the employer's share of payroll taxes is passed on to employees in the form of lower wages and, therefore, that those taxes are effectively being paid by the employees and should be included in before-transfer, before-tax household income.

- *Business income:* Net income from businesses and farms operated solely by their owners, partnership income, and income from S corporations. (Corporations can elect S corporation status if they have 100 or fewer shareholders and meet certain other requirements. S corporations do not pay the corporate income tax but instead must pass through all income and losses to shareholders.)

- *Capital gains:* Profits realized from the sale of assets. Increases in the value of assets that have not been realized through sales are not included in market income.

- *Capital income* (excluding capital gains): Taxable and tax-exempt interest, dividends paid by corporations (but not dividends from S corporations, which are considered part of business income), rental income, and corporate income taxes. CBO assumes in this analysis that corporate income taxes are borne by owners of capital in proportion to their income from capital; therefore, the imputed amount of the corporate tax is included in household income measured before taxes.

- *Other income:* Income received in retirement for past services and any other sources of income.

Labor income accounted for more than 70 percent of market income in most years between 1979 and 2007, although its share of total income had dropped from three-fourths in 1979 to two-thirds by 2007. Capital income (excluding capital gains) is the next largest source, but even at its peak in 1981 it was only about 14 percent of market income. After that, the share of total income from capital declined to about 10 percent of total income in 2007. Income from capital gains rose from about

4 percent of market income in 1979 to about 8 percent in 2007. Business income and income from other sources (primarily private pensions) each accounted for about 7 percent of total income in 2007, up from about 4 percent apiece in 1979.

The Distribution of Various Income Sources. Labor income is more evenly distributed across the income spectrum than business income and capital income, both of which are more evenly distributed than capital gains. In 1979, the bottom 80 percent of the population in the income spectrum received nearly 60 percent of total labor income, about 33 percent of income from capital and business, and about 8 percent from capital gains (see Figure 6). By 2007, the share of labor income going to the bottom 80 percent had dropped to less than 50 percent, their percentage of business income and income from capital had decreased to 20 percent, and their share of capital gains was about 5 percent. All sources of income were less evenly distributed in 2007 than in 1979.

A concentration index can express the concentration of each income source as a single number. It is analogous to a Gini index, and rising values signify rising concentration of income.[11]

Concentration indexes for the major sources of income all increased—albeit irregularly—from 1979 to 2007, indicating rising dispersion in the distribution of each source of income (see Figure 7). Labor income became steadily more concentrated from 1979 through 1988, and then again in 1992 following the 1990–1991 recession. After remaining mostly unchanged during the rest of the 1990s, the concentration of labor income increased again from 1999 through 2002. Since 2002, the concentration has declined slightly, though not back to the levels of the late 1990s.

Capital income became increasingly concentrated beginning in the early 1990s. After declines in 2001 and 2002,

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11. A concentration index differs from a Gini index for each source because in calculating the concentration index, the population is ranked by total market income rather than by income from that source, as they would be in calculating the Gini index for that source. A concentration index can thus range from -1.0 (if all income from a source accrued to the household with the lowest market income), to 0 (if the income from a source was evenly distributed across households), to 1.0 (if all income from a source accrued to the household with the highest market income).

Figure 6.

Concentration of Major Sources of Market Income, 1979 and 2007

(Cumulative share of income, in percent)
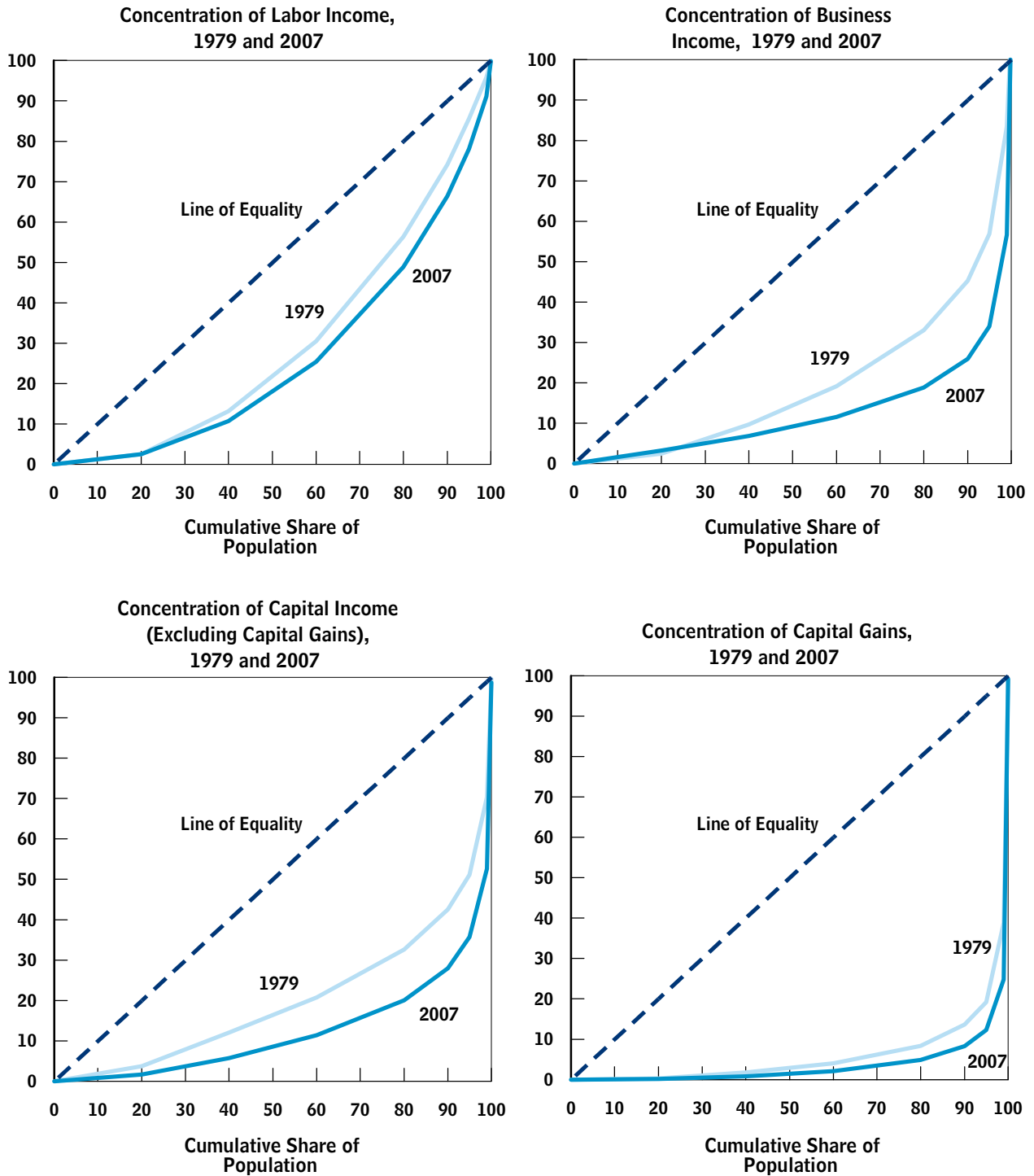
Concentration of Labor Income, 1979 and 2007

Line of Equality

2007

1979

Cumulative Share of Population

Concentration of Business Income, 1979 and 2007

Line of Equality

1979

2007

Cumulative Share of Population

Concentration of Capital Income (Excluding Capital Gains), 1979 and 2007

Line of Equality

1979

2007

Cumulative Share of Population

Concentration of Capital Gains, 1979 and 2007

Line of Equality

1979

2007

Cumulative Share of Population

Source: Congressional Budget Office.

Notes: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see ''Notes and Definitions'' at the beginning of this study.

The line of equality shows what the distribution would be if each income group had equal income.

The concentration curves exclude business and investment losses.

Figure 7.

Income Concentration, by Major Income Source

(Concentration index)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of
        households, the allocation of taxes, and the construction
        of inequality indexes, see ''Notes and Definitions'' at the
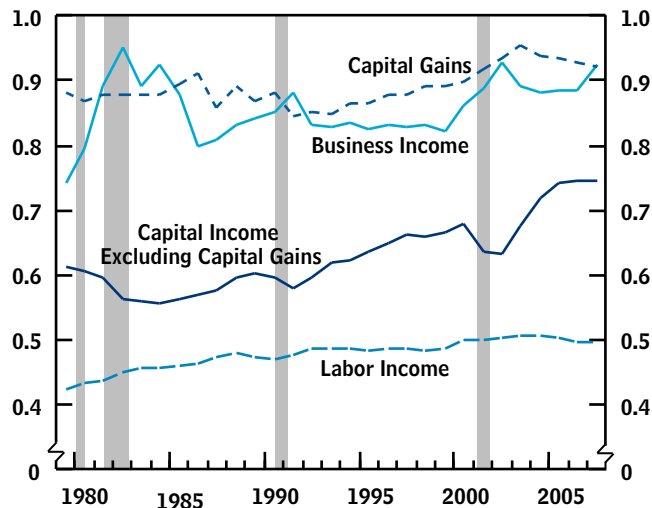   beginning of this study.

its concentration then increased significantly from 2003 through 2007. Capital gains also became increasingly concentrated beginning in the early 1990s; unlike other income from capital, however, the degree of concentration of capital gains continued to rise through 2003 but fell thereafter. The concentration of business income was quite variable in the early part of the 1980s. Some of that variability might reflect changes in tax law in that period. After 1986, the concentration of business income rose steadily through 1991 and then declined through much of the 1990s before rising rapidly in the 2000–2002 period. Since then, the concentration has declined, though not back to the levels that prevailed in the 1990s.

Decomposing Changes in Market Income Inequality by Income Source. A useful property of the Gini index is that it is possible to determine the contribution of different factors to the increase in overall income inequality through a simple decomposition (see Appendix B). The contribution of each income source to the Gini index for total market income is the product of the concentration index for that income source and the share of total market income attributable to that source. Thus, changes in

the concentration of income from a source such as labor income will have a much greater effect on overall income concentration than an equivalent change in the concentration of another income source (such as capital income) because labor income is a much larger share of total income.

Such a decomposition suggests that changes in the income concentration for particular sources and shifts in the shares of market income represented by those sources were responsible in varying proportions for the increase in the concentration of household market income at different times (see Table 1). From 1979 to 1988, more than 90 percent of the increase of 5.7 percentage points in the Gini index for total market income resulted from an increasing concentration of separate income sources, primarily labor income. Small shifts in the share of market income from less to more highly concentrated sources—in particular, from labor income to business and other income—explain only a small portion of the increase in the concentration of total market income over that period.

In contrast, from 1991 to 2000—a period that saw an increase of 4.8 percentage points in the Gini index—a shift to more concentrated sources explains about 45 percent of the overall increase in market income inequality, and an increase in the concentration within each source accounts for the other 55 percent. In that case, a decrease in the percentage of total income from labor and capital and an increase in the share from capital gains were major factors, as were increases in the concentration of both labor and capital income.

The importance of those various factors to the increase of 3.6 percentage points in the Gini index for total market income between 2002 and 2007 differs yet again. More than four-fifths of the total increase in the Gini index over those years stemmed from an increase in the share of total income coming from more highly concentrated capital gains. An increase in the concentration of capital income accounts for most of the remaining increase. Labor income became somewhat less concentrated over that period, but the effect on overall income dispersion was small.

Over the 1979–2007 period as a whole, the increased concentration of the individual sources of market income accounted for close to 80 percent of the total increase in the Gini index.

Table 1.

Sources of Change in the Gini Index for Market Income

	1979 to 1988	1988 to 1991	1991 to 2000	2000 to 2002	2002 to 2007	Total, 1979 to 2007
Change in Gini Index (Percentage points)	5.7	-1.2	4.8	-1.8	3.6	11.1
Source of Change (Percentage points)						
Shift to more or less concentrated income sources	0.4	-0.8	2.2	-2.3	3.1	2.3
Change in concentration within each income source	5.3	-0.3	2.6	0.4	0.5	8.8
Share of Change from Each Source (Percent)						
Shift to more or less concentrated income sources	8	70	45	124	85	21
Change in concentration within each income source	92	30	55	-24	15	79

Source: Congressional Budget Office.

Note: For information on income distributions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Why Has the Distribution of Labor Income Grown More Unequal?

Many studies have documented the increasing inequality of labor income, and the result is robust across data sources and statistical measures. In all likelihood, the interaction of multiple factors has led to the growth in labor income inequality, and disentangling the contribution of those factors will remain a focus of research for some time. Most studies have concentrated on the distribution of cash labor income (CBO uses a broader measure of labor income that also includes some forms of nonwage compensation). Cash labor income is determined by multiple factors—hourly wages (the amount earned by workers per hour worked), the number of hours worked per person in the labor force, and the labor market participation of different members of a household. Of those factors, increases in the inequality of hourly wage rates appear to be the largest contributor to the increased inequality of cash labor income. That trend in the distribution of hourly wages stems primarily from a growing demand for skilled workers relative to the supply of such workers.

Hourly Wage Rates. Hourly wages grew more unequal over the 1979–2009 period, but the pattern of growth varied considerably over time, according to a recent CBO study.[12] For men and women alike, the gap between the wage rates received by high-wage workers (those at the 90th percentile of the wage distribution) and middle-wage workers (those at the 50th percentile) grew

throughout the 30-year period. The gap between the wage rates received by low-wage workers (those at the 10th percentile of the wage distribution) and middle-wage workers widened somewhat during the 1980s, but not since then.

Numerous researchers have concluded that, on balance, the technological changes of the past several decades—and perhaps the entire past century—increased employers' demand for workers with higher skills and more education. That increase, along with a smaller increase in the supply of workers with higher skills and more education, generated substantial gains in the relative wages of more-educated workers.

Specifically, researchers have argued that the *demand* for skilled workers, particularly for highly educated workers, was spurred by innovations in information and computing technology in the 1990s and 2000s. Moreover, innovations in the production process—such as new technology and organizational changes—also may have increased the productivity of higher-skilled workers more than that of lower-skilled workers. For example, some researchers have hypothesized that information technology might complement highly educated workers engaged in abstract tasks while substituting for moderately educated workers performing routine clerical, mechanical,

12. Congressional Budget Office, *Changes in the Distribution of Workers' Hourly Wages Between 1979 and 2009* (February 2011).

and analytical tasks. Those researchers have also surmised that the demand for workers performing "low-skilled" service jobs has not been affected because many of those jobs—such as health aides, security guards, orderlies, cleaners, and servers—are not amenable to automation.[13] Owing to those various changes, firms have increased their demand for highly skilled workers.

At the same time, changes in the relative *supplies* of higher- and lower-skilled workers have been more gradual. The growth in the educational attainment of the workforce has slowed, leading to slower growth in the number of higher-skilled workers compared with the number of lower-skilled workers. That change, coupled with the increasing demand for such workers, has led to the rising relative compensation observed in recent decades for skilled and educated people. [14]

Changes in labor market institutions have also contributed to that trend. Some researchers have noted that the early part of the 1979–2006 period saw a substantial decline in the inflation-adjusted value of the minimum wage, which, they argue, accounted for the slower growth in wages at the bottom of the distribution.[15] Other researchers have noted large declines in the rate of unionization in the United States, especially in the 1980s, and have shown that the decline has reduced the equalizing effect of unions on wages.[16]

Developments in trade and immigration may also have affected the distribution of wage rates. The United States has seen increases in both international trade and immigration in recent decades, and the nation has substantially increased its consumption of imported goods. To the extent that imported goods compete with domestic goods

produced by lower-skilled workers, an increase in imports would be expected to hold down wages of domestic workers. The empirical research on that effect is inconclusive, however.[17] In addition, changes in the supply of workers attributable to a rising number of foreign-born people in the workforce increase the availability of workers with a broad range of skills, potentially putting downward pressure on wage rates in jobs where they work. Empirical research, however, indicates that the impact of foreign-born workers on wage dispersion has been modest.[18]

Annual Earnings. Another recent CBO study examined the distribution of annual earnings, which is the product of hours worked and wages per hour.[19] That study found that annual earnings have grown more unequal over time for men but not for women and that changes in the number of hours worked have tended to reduce inequality. For men, the ratio of the annual earnings of high earners to those of median earners was larger in 2007 than in 1979, whereas the annual earnings ratio for median and low earners was roughly the same in the two years. Men with the lowest annual earnings increased their work hours somewhat over the period; otherwise, inequality in annual earnings would have grown even more. For women, in contrast, the ratio of the annual earnings of high earners to those of median earners was roughly the same in 2007 as it was in 1979, but the ratio of annual earnings of median earners to those of low earners was smaller in 2007 than it was in 1979. Women at the 10th percentile of their earnings distribution experienced a rapid rise in annual earnings in large part because of increases in the number of hours they worked.

Increases in Women's Labor Force Participation and Earnings. The role of women in the labor market changed dramatically over the time period studied here. Women's participation in the labor force rose rapidly, and the gaps between hourly wage rates and annual earnings for men and women narrowed. In addition, inequality in

13. David H. Autor, Lawrence F. Katz, and Melissa S. Kearney, "Trends in U.S. Wage Inequality: Revising the Revisionists," *Review of Economics and Statistics,* vol. 90, no. 2 (May 2008), pp. 300–323.

14. Claudia Goldin and Lawrence F. Katz, "Long-Run Changes in the U.S. Wage Structure: Narrowing, Widening, Polarizing," *Brookings Papers on Economic Activity,* no. 2 (Fall 2007), pp. 135–165.

15. David Lee, "Wage Inequality in the United States During the 1980s: Rising Dispersion or Falling Minimum Wage?" *Quarterly Journal of Economics*, vol. 144, no. 3 (August 1999), pp. 977–1023.

16. David Card, Thomas Lemieux, and Craig Riddell, "Unions and Wage Inequality," *Journal of Labor Research,* vol. 25, no. 4 (December 2004), pp. 519–562.

17. Paul Krugman, "Trade and Wages, Reconsidered," *Brookings Papers on Economic Activity,* no. 1 (Spring 2008), pp. 103–154.

18. Congressional Budget Office, *The Role of Immigrants in the U.S. Labor Market* (November 2005); and David Card, *Immigration and Inequality,* Working Paper 14683 (Cambridge, Mass.: National Bureau of Economic Research, January 2009).

19. Congressional Budget Office, *Changes in the Distribution of Workers' Annual Earnings Between 1979 and 2007* (October 2009).

Figure 8.

Summary Measures of Market Income Inequality for Different Types of Households
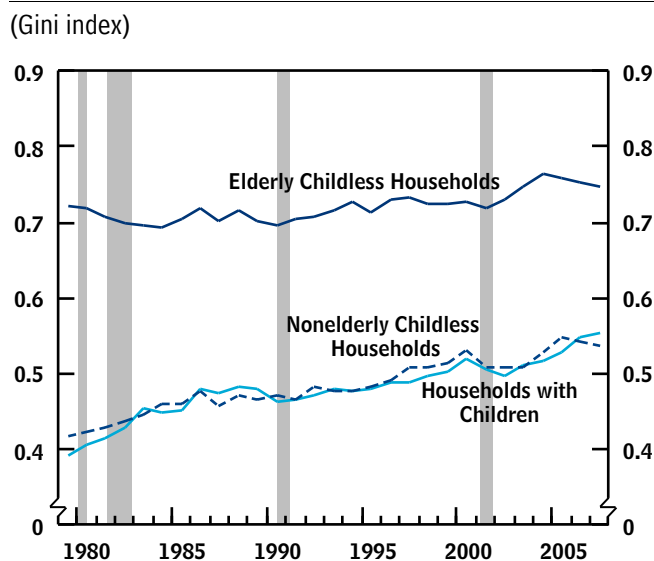
(Gini index)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

wage rates among working women grew, though that change was more than offset by changes in hours worked, so inequality of annual earnings did not grow.

Even if the distribution of women's earnings had been unchanged, trends in women's earnings could have changed the inequality of household income. Because married couples tend to have higher income than single people, even after adjusting for differences in household size, an increase in the earnings of women could boost inequality by raising the income of couples relative to that of households headed by single people. The effect of women's earnings on the inequality of household income also depends on the correlation between husbands' and wives' earnings: Relatively faster growth of earnings for women married to men with high earnings would tend to exacerbate the inequality of household income, whereas faster growth of earnings for women married to men with low earnings would tend to decrease it, even holding constant the inequality of women's earnings. Empirical studies on the effect of women's earnings on the inequality of family income have found mixed results, with

estimates depending on the period studied and the methodology used.[20]

The data used by CBO in this study are not sufficient for isolating the effect of women's earnings, for two reasons: Sex is not reported in the tax return data, and only the combined earnings of married couples are directly reported on tax returns.[21]

How Did the Distribution of Market Income Change for Different Types of Households?

Trends in market income for the entire population mask significant variations in the amount, composition, and distribution of market income among subgroups of the population. Income dispersion is smaller among households with children (households with at least one member under age 18) and nonelderly childless households (households headed by someone under age 65 with no member under age 18) than among elderly childless households (those headed by someone age 65 or older with no member under age 18) (see Figure 8). The levels and trends in the dispersion of market income for households with children and nonelderly childless households are virtually identical. Because they account for the majority of households, and an even larger share of

20. Sheldon Danziger, "Do Working Wives Increase Family Income Inequality?" *Journal of Human Resources,* vol. 15, no. 3 (Summer 1980), pp. 444–451; Lynn A. Karoly and Gary Burtless, "Demographic Change, Rising Earnings Inequality, and the Distribution of Personal Well-Being," *Demography,* vol. 32, no. 3 (August 1995), pp. 379–405; Gary Burtless, *Effects of Growing Wage Disparities and Changing Family Composition on the US Income Distribution,* Working Paper 4 (Center on Social and Economic Dynamics, July 1999); and three articles by Maria Cancian and Deborah Reed: "The Impact of Wives' Earnings on Income Inequality: Issues and Estimates," *Demography,* vol. 36, no. 2 (May 1999), pp. 173–184, and "Sources of Inequality: Measuring the Contributions of Income Sources to Rising Family Income Inequality, *Review of Income and Wealth,* vol. 47, no. 3 (September 2001), pp. 321–333, and "Assessing the Effects of Wives' Earnings on Family Income Inequality," *Review of Economics and Statistics,* vol. 80, no. 1 (February 1998), pp. 95–107.

21. CBO has estimated the split of earnings between spouses based on a combination of information reported on tax forms and in the Current Population Survey and examined the effect on household income dispersion of the earnings of so-called secondary earners— the spouses with lower earnings. The Gini index for household income including the earnings of secondary earners was about 1 percent lower than the Gini index excluding those earnings over the 1979–2007 period.

Figure 9.

Summary Measures of Market Income Inequality, With and Without the Top 1 Percent of Households

(Gini index)
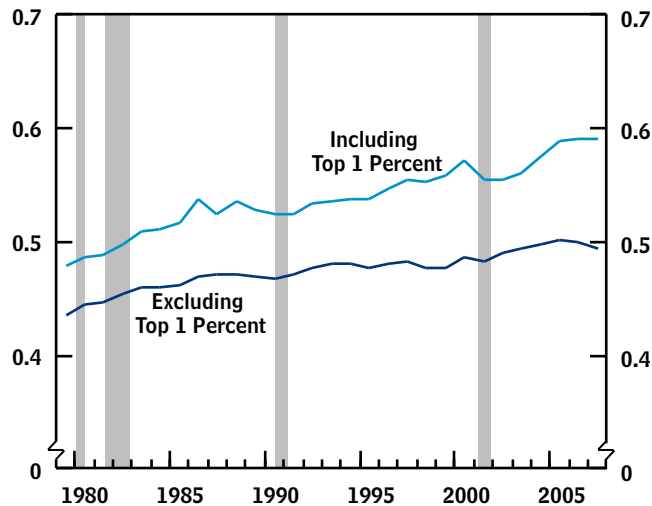
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see ''Notes and Definitions'' at the beginning of this study.

market income, the overall trend in market income dispersion closely mirrors that of those two subgroups.

In contrast, because many elderly people no longer work, the composition of market income and the extent of market income dispersion among elderly childless households differ from that of other households. On average, compared with households headed by the nonelderly, elderly households have much less labor income and substantially more income from accumulated savings—in the form of pension income, interest and dividends, and capital gains. On average, elderly households have less market income than other households. Indeed, the bottom fifth of elderly childless households has essentially no market income, and the second fifth has very little. Most of the income for those groups comes from Social Security benefits or other government transfer programs (which are examined later). And among the upper three-fifths of the distribution, income is a little more skewed to the top for elderly childless households than for other types of households.

The trend in income dispersion for elderly childless households has differed from trends for the rest of the population during the past 30 years. The difference in the early 1980s is especially striking, when dispersion for elderly childless households fell while dispersion for other households rose. That period saw an increase in the concentration of labor income accompanied by a decrease in the dispersion of capital income. Because many elderly people no longer work, the latter effect was relatively more important for elderly childless households than for the overall population and caused a decline in income inequality among them. The elderly also saw less of an increase in income inequality in the late 1990s, when the dispersion in labor income again grew rapidly.

Changes in Market Income for the Top 1 Percent of the Population

The rapid growth of average market income for the 1 percent of the population in households with the highest income was a major contributing factor to the increase in household income dispersion between 1979 and 2007. Average market income for the highest income group tripled over that period.

Without the income growth at the very top of the distribution, income dispersion still would have increased, but not by as much (see Figure 9). The Gini index for market income rose from 0.479 in 1979 to 0.590 in 2007, a 23 percent increase. Recalculating the Gini index by excluding the 1 percent of the population in households with the highest income in each year reduces the increase to 14 percent (from about 0.435 in 1979 to 0.495 in 2007).[22]

Composition of Income for the Top 1 Percent of the Population

Between 1979 and 2007, the composition of market income for the 1 percent of the population in households with the highest income changed significantly. The share of market income from wages and other labor compensation rose and then fell for little net change, while the

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22. A recent paper argues that any substantial increase in U.S. income inequality from 1993 to 2004 is confined to the top percentile of the income distribution (see Burkhauser and others, *Estimating Trends in US Income Inequality*). In contrast, CBO finds that the growth in income for the top percentile accounted for just a bit more than half of the rise in market income inequality over that period.

Figure 10.

Shares of Market Income, by Source, for the Top 1 Percent of Households

(Percentage of market income, excluding capital gains)
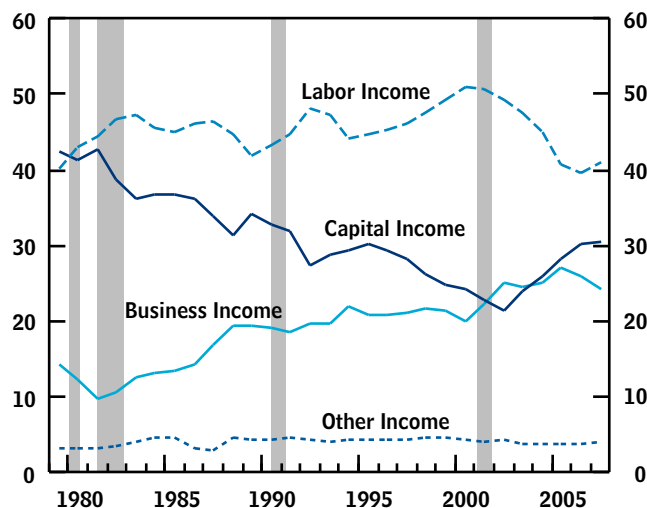
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

share of income from capital assets declined. Business income was the fastest growing source of income for the top 1 percent.

Because of the volatile nature of income from capital gains realizations and its significance for the highest-income households, it is more illuminating to look at sources of income as shares of market income excluding capital gains. Wages and other labor compensation rose from 40 percent of market income excluding capital gains in 1980 to close to 50 percent in 2000 and 2001 before dropping back to about 40 percent in 2007 (see Figure 10).

Capital income excluding capital gains—in other words, interest, dividends, and rents—has generally been a declining source of income among the highest-income households. Its share dropped from 42 percent of market income excluding capital gains in 1979 to 21 percent in 2002 and then increased to about 30 percent by 2007. Over the same period, the share of income from business activities grew sharply, increasing from a low of 10 percent of market income excluding capital gains in 1981 to

a high of 27 percent in 2005 before dipping slightly in 2006 and 2007.

Capital gains are the most volatile source of income, and their importance as a share of household income for the top 1 percent of the population has fluctuated. That fluctuation appears to reflect movements in stock prices and changes in tax law.[23] Between 1979 and 1985, capital gains for the top 1 percent were equal to 20 percent to 30 percent of market income excluding capital gains; in 1986, they spiked to more than twice that share. The ratio of income from capital gains to other market income declined in the late 1980s and then began to pick up in the mid-1990s before entering a period of rapid growth starting in 1995. That ratio peaked at 35 percent of market income in 2000 before falling to 16 percent in 2002 and then rebounding to 37 percent in 2007.

The fall in capital income and the increase in business income may in part reflect a recharacterization of income. Following the Tax Reform Act of 1986, which lowered the top statutory tax rate on individual income below the top rate on corporate income, many C corporations (which are taxed separately from their owners under the corporate income tax) were converted to S corporations (which pass corporate income through to their shareholders, where it is taxed under the individual income tax). As a result, corporate dividend income and capital gains from the sale of corporate stock were converted into S corporation income, which is counted here as part of business income. Business income jumped in the 1986–1988 period as those conversions began, and it continued to grow rapidly throughout the 1990s and 2000s as more conversions occurred and new businesses were formed as S corporations rather than C corporations.

The changing composition of income for the highest-income households reflects a much longer trend. Over the entire 20th century, capital income declined sharply in importance for high-income taxpayers.[24] The labor share of income for the top income groups was higher in 2007 than before World War II, as highly compensated workers have replaced people whose income is from property or securities at the top of the income distribution.

23. See Congressional Budget Office, *Capital Gains Taxes and Federal Revenues* (October 2002).

24. Piketty and Saez, "Income Inequality in the United States."

What Explains the Rise in Income for the Top 1 Percent?

Rising labor income was a major component of the increase in income for the top 1 percent. A number of factors may have contributed to the rapid rise in earnings among the highest-income households. One potential explanation is that the compensation of "superstars" (such as actors, athletes, and musicians) may be especially sensitive to technological changes.[25] Unique characteristics of that labor market mean that technical innovations, such as cheap mass media, have made it possible for entertainers to reach much wider audiences. That increased exposure, in turn, has led to a manyfold increase in income for such people.

Another body of research has focused on the very large pay increases for top corporate executives.[26] Some researchers have argued that this growth in compensation can be accounted for by increases in firms' size. As firms grow larger and more complex, the impact on profits of corporate executives' decisions becomes greater, so firms may be more willing to pay large salaries to attract and keep the best executives. Other researchers have argued that weaknesses in corporate governance have enabled corporate executives to overpay themselves. Still others have focused on the form of compensation, arguing that the increasing importance of stock options in executive compensation has caused that compensation to grow rapidly during periods of rapid appreciation in the stock market.

Some researchers have attempted to evaluate the competing theories by dividing the highest earners into subgroups and by observing which subgroups saw the greatest increases in income. One study compiled the earnings in 2004 of the highest earners in various sectors of the economy on the basis of publicly available data, such as corporate annual reports and industry publications.[27] Using that approach, the authors were able to

identify 9 percent of the taxpayers in the top 0.5 percent of the earnings spectrum. They found that corporate executives were a fairly small percentage of the highest earners, as were athletes and celebrities, and they did not grow in importance over the 1994–2004 period. In contrast, employees in the financial and legal professions made up a larger share of the highest earners than people in those other groups. The authors concluded that their findings are most consistent with the theories that technical changes have enhanced the value of certain skills and that the increasing scale of corporate and financial activity has raised the value of corporate executives and financial professionals, rather than that weak corporate governance has led to excessive compensation.

A similar study compiled data on the highest-income households on the basis of occupations reported on tax returns in the 1979–2005 period.[28] That study reached different conclusions. Its authors found that the rise in the highest-income households' share of income is explained by the prices of assets in financial markets and possibly by the evolution of corporate governance and entrepreneurship, rather than by superstar theories or by technological change that complemented certain skills. The study found that nonfinancial executives, managers, and supervisors made up the largest subgroup of the highest-income households, accounting for 31 percent of the top percentile. Medical professionals were the second largest occupational category, making up 16 percent, while financial professionals accounted for 14 percent and lawyers for 8 percent. No other single occupational group accounted for more than 5 percent of the top percentile. Some occupations have maintained steady shares of the top percentile over time, whereas others' shares have changed. Since 1979, nonfinancial executives saw their share decline a bit, from 36 percent to 31 percent. Within that group, the share attributable to salaried professionals declined sharply, while the share for executives of small businesses grew. The share of financial professionals almost doubled from 1979 to 2005. The study found that income growth was high for all the top-earning professions but varied substantially both within and across professions between those at the very highest part of the income scale and the rest of the top percentile. Executives, managers, supervisors, and financial

25. Sherwin Rosen, "The Economics of Superstars," *American Economic Review*, vol. 71, no. 5 (December 1981), pp. 845–858.

26. For a review of that literature, see Robert J. Gordon and Ian Dew-Becker, "Selected Issues in the Rise of Income Inequality," *Brookings Papers on Economic Activity*, no. 2 (Fall 2007), pp. 169–190.

27. Steven N. Kaplan and Joshua D. Rauh, "Wall Street and Main Street: What Contributes to the Rise in the Highest Incomes?" *Review of Financial Studies*, vol. 23, no. 3 (March 2010), pp. 1004–1050.

28. Jon Bakija, Adam Cole, and Bradley T. Heim, *Jobs and Income Growth of Top Earners and the Causes of Changing Income Inequality: Evidence from U.S. Tax Return Data*, Working Paper 2010-24 (Williamstown, Mass: Williams College, November 2010).

professionals accounted for 60 percent of the increase in income accruing to the top percentile of the income distribution between 1979 and 2005.

Because of the important role of the financial sector, some researchers have focused on the pattern of compensation in that sector over a long period.[29] They found that the financial sector has become more complex since the 1980s and has thus needed more skilled labor. But even accounting for the education and skills of the workforce, the compensation differential between the financial sector and the rest of the economy appears inexplicably large from 1990 onward. The authors believe that deregulation and corporate finance activities linked to initial public offerings and credit risk are the primary causes of the higher compensation differential. However, because that particular study did not focus on the highest earners, it is not clear to what extent its findings can explain the rapid rise in income shares at the top of the distribution.

Others have argued that the observed growth in the conversion of C corporation income into S corporation income has contributed to the rapid growth in income for the highest-income households. That effect arises because such conversion can alter the timing of income. S corporations are required to pass all of their profits through to their shareholders in the year that they are earned, while C corporations face no such requirement. That phenomenon might be a contributing factor, but it can explain only a portion of the increase in the share of market income for the top 1 percent, much of which has come from increases in earnings.

The Effect of Government Transfer Payments and Federal Taxes

Even though an increasing concentration of market income was the primary force behind the growing dispersion in after-tax household income between 1979 and 2007, shifts in the distribution of government transfer payments and federal taxes also contributed to the increase in after-tax income inequality.[30]

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29. Thomas Philippon and Ariell Reshef, *Wages and Human Capital in the U.S. Financial Industry: 1909–2006,* Working Paper 14644 (Cambridge, Mass.: National Bureau of Economic Research, January 2009).

30. This study does not include state and local taxes, an issue discussed in more detail in Appendix A.

Overall, transfers and federal taxes reduce income inequality. Transfers tend to make income more equal by boosting income for people at the bottom of the scale, and federal taxes tend to make income more equal because average tax rates (taxes as a percentage of household income) increase as income rises. In addition, the earned income tax credit, which in this analysis is included with federal taxes (though some of its benefits are conveyed in the form of government payments), has an effect on the income distribution similar to that of transfers by raising the after-tax income of lower-income households.

The effect of transfers and taxes on the dispersion of household income can be seen by comparing the Gini index for market income with the Gini index for after-transfer, before-tax income and the Gini index for after-transfer, after-federal-tax income. A proportional transfer and federal tax system would leave the Gini index for after-transfer, after-federal-tax income equal to that for market income. Transfers that are a decreasing percentage of market income as income rises (progressive transfers) lower the Gini index, as do federal taxes that are an increasing percentage of before-tax household income as income rises (progressive taxes). Because both transfers and federal taxes are progressive in the United States, they reduce the Gini index (see Figure 11). The dispersion of after-tax income in 2007 is about four-fifths as large as the dispersion of market income. Roughly 60 percent of the difference in dispersion between market income and after-tax income is attributable to transfers and roughly 40 percent is attributable to federal taxes.

The redistributive effect of transfers and federal taxes was smaller in 2007 than in 1979 (see Figure 12). In 1979, transfers and federal taxes reduced the Gini index from 0.479 to 0.367, a decrease of 11 percentage points (or 23 percent). In 2007, transfers and federal taxes reduced the Gini index from 0.590 to 0.489, a decline of 10 percentage points (or 17 percent). If transfers and federal taxes had had the same proportional equalizing effect in 2007 as they did in 1979, the Gini index for household income after transfers and federal taxes would have been 0.452 in 2007 instead of its actual value of 0.489.

Expressed in 2007 dollars, transfers and federal taxes reduced the average income difference between pairs of households in 1979 from $34,500 (twice 47.9 percent of market income) to $22,600 (twice 36.7 percent of income after transfers and federal taxes). In 2007,

Figure 11.

Summary Measures of Income Inequality, With and Without Transfers and Federal Taxes
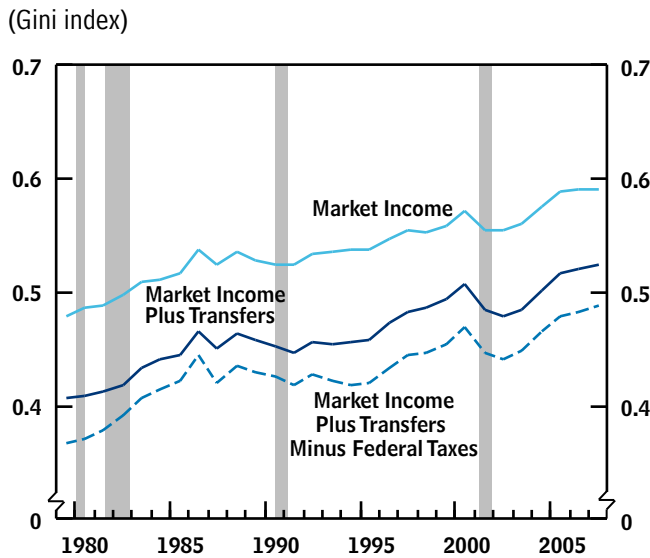
(Gini index)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

transfers and federal taxes reduced the average difference from $66,600 to $48,900. Those reductions occurred because income after transfers and federal taxes is more evenly distributed than market income and because it is smaller, on average.

As a result of the diminishing effect of transfers and federal taxes, the Gini index for income after transfers and federal taxes grew by more than the index for market income. Between 1979 and 2007, the Gini index for market income increased by 23 percent, the index for market income after transfers increased by 29 percent, and the index for income measured after transfers and federal taxes increased by 33 percent.

The equalizing effect of transfers and taxes depends on their degree of progressivity and on their size relative to household income. Holding the size of transfers and taxes constant, an increase in the progressivity of transfers and taxes will reduce income inequality. Holding the degree of progressivity constant, an increase in the size of trans-

fers and taxes will also reduce inequality (assuming that both transfers and taxes are progressive).

The equalizing effect of transfers declined over the 1979–2007 period primarily because the distribution of transfers became less progressive. The equalizing effect of federal taxes also declined over the period, in part because the amount of federal taxes shrank as a share of market income and in part because of changes in the progressivity of the federal tax system.

Government Transfer Payments

The amount of government transfer payments—including federal, state, and local transfers—relative to household market income was relatively constant from 1979 through 2007, ranging between 10 percent and 12 percent with no discernible trend (see Figure 13). Social Security benefits accounted for between 55 percent and 60 percent of the value of all transfers in each year of the period, equaling about 6½ percent of market income, on average. Even though average Social Security benefits grew more slowly than average income, the population receiving benefits grew faster than the overall population.

Figure 12.

Reduction in Income Inequality from Transfers and Federal Taxes
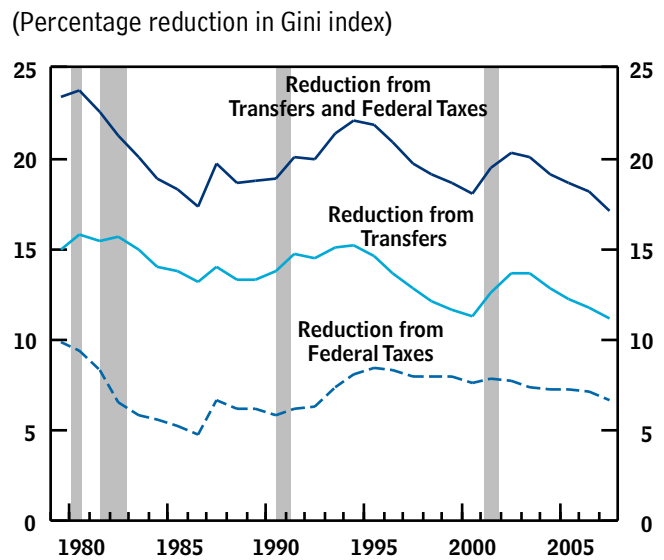
(Percentage reduction in Gini index)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Figure 13.

Transfers as a Percentage of Household Market Income
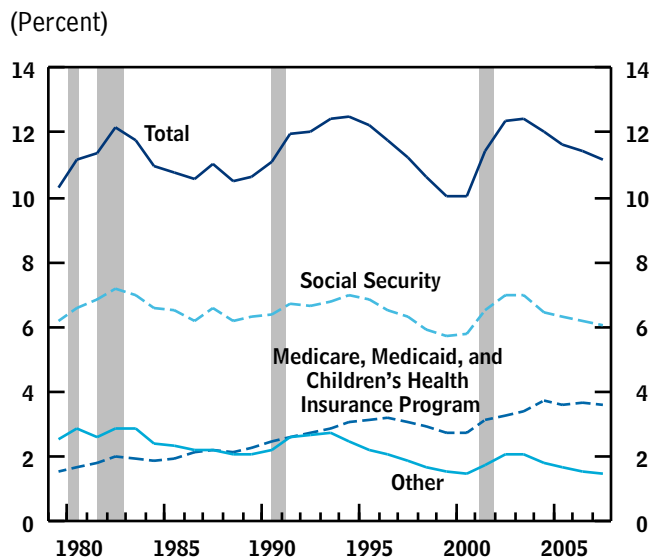
(Percent)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Medicare, Medicaid, and Children's Health Insurance Program benefits—measured here as their so-called fungible value—rose from under 2 percent to over 3 percent of market income.[31] Other transfers declined from nearly 3 percent of market income at their peak in 1982 to under 2 percent by 2007.[32]

For transfer payments other than Social Security and unemployment insurance benefits, CBO relied on estimates of participation and benefit amounts from the Census Bureau's Current Population Survey.[33] Those payments are underreported in the survey. Adjusting for

underreporting to the extent possible would reduce the estimated inequality of after-transfer income but would have little effect on trends in inequality measured over long periods (see Box 3).

Effects of Transfers on Different Income Groups. The shifts in the relative importance of different transfer programs since 1979 moved the distribution of transfer benefits away from households in the lower part of the income spectrum to some extent (see Figure 14 on page 24). Rapid growth in Medicare, which is not means-tested (in other words, not provided to people based on a test of need determined by their income and assets), tended to shift more transfer income to middle- and upper-income households. At the same time, spending on Aid to Families with Dependent Children and its successor, Temporary Assistance for Needy Families, has declined relative to market income; benefits from those means-tested programs are heavily concentrated at the bottom of the income scale. As a result, households in the lowest-income quintile received 54 percent of federal transfer payments in 1979 and 36 percent in 2007.

As a consequence of those shifts, the redistributive effect of transfers has changed over time and changed in different ways for subgroups of the population. Largely because of the decrease in the share of transfers accruing to households in the lower part of the income scale, the overall redistributive effect of transfers lessened between 1979 and 2007 (see Figure 12). That decline was irregular, though, as the effect of transfers increased in periods in which transfer income grew more quickly than market income (such as the recessions of 1990–1991 and 2001) and decreased in periods in which transfer income grew more slowly than market income.

Effects of Transfers on Different Types of Households. Because outlays on programs focused on the older population (such as Social Security and Medicare) have grown

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31. Fungible value is a measure developed by the Census Bureau and used in its alternative income definitions. It is generally the amount of resources freed up for other uses by the services provided through a transfer program; the measure is intended to capture the value of the in-kind benefit to the recipient. The fungible value of Medicare, Medicaid, and the Children's Health Insurance Program has grown more slowly than expenditures for those programs because the fungible value is constrained by slow income growth among low-income recipients. Appendix C provides more details on the concept, as well as a general discussion of the effect of health care benefits on measures of income inequality.

32. Transfers as measured in this study do not equal total government expenditures on the same transfer programs, for several reasons. Importantly, health care programs are valued at their fungible value as defined by the Census Bureau, not by their expenditures. Also, some transfer payments are received by individuals not in the scope of the Census Bureau's survey data, such as the institutionalized population, and some recipients misreport the amount of transfer payments they receive.

33. Information used in this study on recipients and benefit amounts for Social Security and unemployment insurance came primarily from tax returns.

Box 3.

The Misreporting of Transfer Income

In its measure of transfer income, the Congressional Budget Office (CBO) includes payments from most government transfer programs: Social Security, Medicare, Medicaid, the Supplemental Nutrition Assistance Program (SNAP, formerly called the Food Stamp program), Supplemental Security Income (SSI), Temporary Assistance for Needy Families (TANF, and its predecessor, Aid to Families with Dependent Children, AFDC), unemployment insurance, and state and local government cash transfers, as well as housing subsidies, energy assistance, and free or reduced-price school breakfasts and lunches. Those sources of income are quite important for many low-income households.

Tax returns contain little information about transfer income because most of it is not taxed. For Social Security and unemployment insurance benefits, which are partially taxable, CBO uses information from tax returns together with information from the Current Population Survey (CPS). CBO's estimates of income from those sources generally exceed 90 percent of the amount that the government agencies that administer the programs report paying in benefits.

For transfer payments other than Social Security and unemployment insurance benefits, CBO relies on estimates of participation and benefit amounts from the CPS. Unfortunately, the shares of different types of transfer payments that are reported in the CPS are relatively low, and they have generally been declining over time. A recent study found that the share of Food Stamp benefit dollars captured in the CPS declined from 67 percent in 1993 to 55 percent in 2005.[1] For AFDC and TANF, reporting rates declined from 75 percent in 1993 to 57 percent in 2005. In contrast, reporting of SSI benefits rose from 76 percent to 82 percent over the same period.

To analyze how the misreporting of transfer income might affect estimates of the income distribution, CBO tabulated data from the Transfer Income Model (TRIM3).[2] That model corrects for the misreporting

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1. Laura Wheaton, "Underreporting of Means-Tested Transfer Programs in the CPS and SIPP," *2007 Proceedings of the American Statistical Association*, Social Statistics Section [CD-ROM] (Alexandria, Va.: American Statistical Association, 2007), pp. 3622–3629.

2. The model was developed and is maintained by the Urban Institute, with funding primarily from the Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. TRIM3 requires users to input assumptions and interpretations about economic behavior and the rules governing federal programs. Therefore, the conclusions presented here are attributable only to CBO.

Continued

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faster than outlays on other transfer programs, the share of transfers received by elderly childless households has likewise increased, while the portion going to households with children has declined. Elderly households received 62 percent of total transfers in 1979 and 68 percent in 2007 (see Figure 15 on page 24). Households with children received a much smaller and declining share of transfers—19 percent in 1979 and 12 percent in 2007.[34]

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34. In this analysis, the full amount of the earned income tax credit, including the refundable portion, is counted as a reduction in federal taxes (although some of those amounts are paid to people because they exceed the recipients' other tax liabilities).

Nonelderly childless households saw the smallest fluctuations in their share of transfers, which ranged between 17 percent and 21 percent over the period. The most significant sources of cash transfers for nonelderly childless households are Social Security disability benefits and retirement benefits for early retirees (those who retire between age 62 and age 65), unemployment insurance benefits, and workers' compensation. Some of those households also receive health insurance through Medicare or Medicaid.

Transfers have a large redistributive effect for elderly childless households because those households receive a

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Box 3.   **Continued**

The Misreporting of Transfer Income

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of transfer income by applying the rules of several transfer programs to each household in the CPS to determine if households are eligible for benefits and, if so, the size of the benefit they can receive. Households that report receiving benefits, and who appear to be eligible, are assigned the computed amount of the benefit. Households that report receiving benefits but who appear to be ineligible are assumed to receive no benefits. For households that do not report receiving benefits but who appear to be eligible, new participants are created in such a way as to match the number and characteristics of recipients reported in government agencies' program data. The model targets the number of recipients rather than the overall amount of benefits, but the estimated benefit amounts approximate the agencies' totals.

To assess the sensitivity of its main analysis to the misreporting of transfers, CBO combined estimates of transfer payments from TRIM3 with its own merged data from tax returns and the CPS. For the programs covered by TRIM3—Food Stamps, SSI, TANF/AFDC, and housing subsidies—CBO replaced benefits as reported in the CPS with benefits as estimated using TRIM3. CBO then recalculated

income, reranked households according to their corrected income, and tabulated new estimates of the distribution of income. CBO did that analysis for 1993 and 2004, the earliest and latest years for which TRIM3 estimates are available.

Underreporting of transfer income increased between 1993 and 2004. However, transfer income increased more slowly than market income over that period. As a result, the reporting adjustments were larger in 2004 than in 1993 as a share of transfer income, but smaller as a share of total household income. Therefore, the reporting adjustments had a smaller effect on the Gini index in 2004 than in 1993.

Adjusting for the misreporting of transfer payments adds income for households at the bottom of the distribution of income. Consequently, the Gini index adjusted for misreporting is lower than the unadjusted Gini index. For 1993, reporting adjustments cause the Gini index to fall from 0.455 to 0.450, or by about 1 percent; for 2004, reporting adjustments lower the Gini index from 0.502 to 0.498, or by 0.8 percent.

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large share of transfers and because they have below-average market income. Over the 1979–2007 period, transfers ranged from 45 percent to 60 percent of market income for the elderly. Those transfers reduced income inequality (measured by the Gini index) among elderly households by between 25 percent and 35 percent during that period (see Figure 16). The redistributive effect of transfers for those households fluctuated throughout the period, largely reflecting changes in the size of transfers relative to other income. There has been a trend toward a smaller share of transfer payments that accrue to elderly households accruing to the low-income elderly, lessening the redistributive effect over the period.

The effect of transfers on income inequality is much smaller for households with children and nonelderly

childless households. For those groups, transfers equaled between 4 percent and 6 percent of market income. Early in the 1979–2007 period, transfers had a larger redistributive effect on households with children, but that effect diminished in the mid- to late 1990s to the level experienced by nonelderly childless households. That convergence occurred because transfers as a share of income decreased for households with children and because the share of those payments accruing to lower-income households fell.[35] For both groups, the redistributive effect of transfers rose in years near the 1990–1991

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35. An increase in the refundable portions of the earned income tax credit and the child tax credit (which are not counted as transfers here) largely offsets the decline in transfer payments to low-income families with children.

and 2001 recessions, when transfer payments grew faster than market income.

Federal Taxes

Changes in the effect of taxes on the distribution of after-tax income can come about because of a change in the overall average tax rate, a change in the composition of taxes, or changes in the progressivity of particular taxes. Over the 1979–2007 period:

- The overall average federal tax rate (combined federal taxes as a share of household income including transfers) fell by a small amount,

- The composition of federal revenues shifted away from income taxes to payroll taxes (which are less progressive),

- The federal individual income tax became slightly more progressive, and

- The payroll tax became slightly less progressive.

Figure 14.

Share of Total Transfers, by Market Income Group
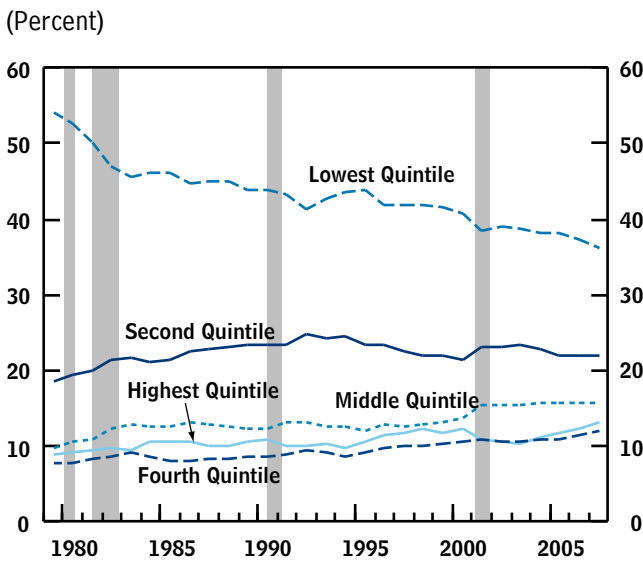
(Percent)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Figure 15.

Share of Total Transfers, by Type of Household
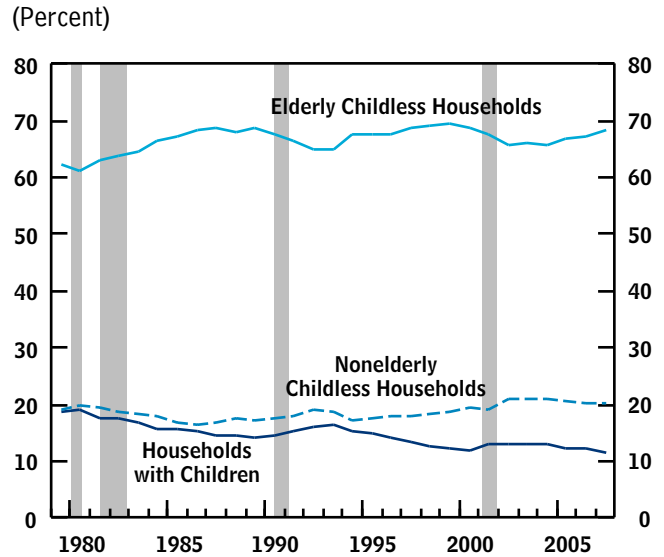
(Percent)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

On balance, those factors reduced the extent to which federal taxes lessened the degree of income inequality.[36] As a result, the increase in inequality of after-tax income was greater than the increase in inequality of before-tax income.

A Lower Average Federal Tax Rate. The overall average federal tax rate dropped from 22 percent in 1979 to 20 percent in 2007 (see Figure 17). The average tax rate declined in the early 1980s, then rose through much of the 1980s and 1990s. It peaked at 23 percent in 2000, and then fell sharply following the 2001 recession and tax legislation enacted in 2001 and 2003, reaching just under 20 percent in 2003, the lowest rate since 1979. By 2007, the overall rate had risen to just above 20 percent, a percentage point below the average for the 29-year period.

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36. CBO's measure of federal taxes includes individual and corporate income taxes, social insurance (payroll) taxes, and excise taxes. CBO did not include state and local taxes in this analysis because of the difficulty of estimating them over a long time period. It is unclear how that omission affects conclusions about the redistributive effect of taxes (see Appendix A for more discussion).

Figure 16.

Reduction in Income Inequality from Transfers for Different Types of Households
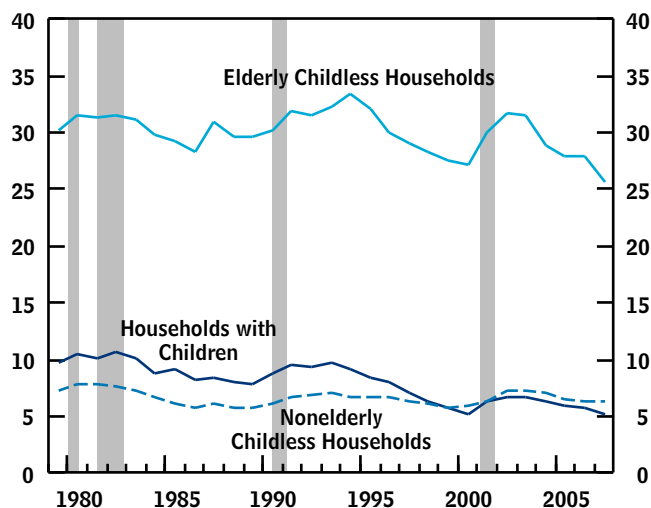
(Percentage reduction in the Gini index)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

A Shift from Income Taxes to Payroll Taxes. The composition of federal taxes changed between 1979 and 2007, as payroll taxes grew faster than income taxes. The average payroll tax rate (social insurance taxes as a percentage of household income including transfers) was slightly higher in 2007 than it was in 1979, but the average individual income tax rate was slightly lower. Those variations stemmed from a combination of legislative changes and economic developments.

The increase in the payroll tax rate in the 1980s resulted from legislated increases in the cap on earnings subject to the Social Security payroll tax and from legislation enacted in 1983 that accelerated previously scheduled increases in the Social Security payroll tax rate. Subsequent legislation in the early 1990s first increased and then eliminated the cap on earnings subject to the Hospital Insurance payroll tax (which is used to finance a portion of Medicare). The payroll tax rate declined in the late 1990s and early 2000s as labor income grew more slowly than other income sources and as earnings above

the maximum level subject to Social Security taxes grew more rapidly than earnings below that level.

The average individual income tax rate peaked at 12 percent of household income in 1981. That rate then fell as the reduction in tax rates enacted in 1981 took effect. The average individual income tax rate rose again in the late 1990s because of legislation enacted in 1993 and because of rapidly rising incomes. After 2000, the rate fell once more as a result of the 2001 and 2003 tax cuts and the recession in 2001.

An Increase in the Progressivity of Federal Individual Income Taxes. Virtually all of the progressivity of the federal tax system derives from the individual income tax. Average federal income tax rates in 2007 ranged from -5.6 percent for households in the lowest income quintile to 18.8 percent for the 1 percent of the population with the highest income (see the top panel of Figure 18). The lowest income quintile has a negative average federal tax rate because, as a group, households in that quintile qualify for more in refundable tax credits than they owe in

Figure 17.

Federal Taxes as a Percentage of Household Income Including Transfers

(Percent)
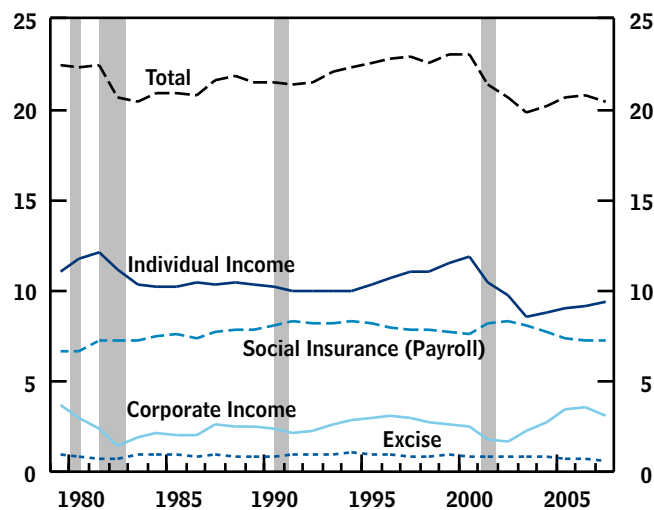
Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

Figure 18.

Federal Taxes as a Percentage of Household Income, by Income Group

(Percent)

Individual Income Taxes

Payroll Taxes

All Federal Taxes

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

income taxes before the credits are applied. Average federal income tax rates were lower in 2007 than in 1979 across the income distribution. The pattern in the intervening years is more varied, reflecting the interaction of numerous changes to tax law and changes in the composition and distribution of income.

After rising between 1979 and 1983, average federal individual income tax rates declined almost continuously thereafter for the 60 percent of the population in the three middle income quintiles. For example, the income tax rate for the middle quintile declined from approximately 8 percent in 1981 to about 3 percent in 2003 and remained at about that level through 2007. The rapid decline in the rates between 2000 and 2003 reflects numerous changes in law enacted in 2001—such as the expansion of the child tax credit, reductions in tax rates, and reductions in the income tax burden on married couples—that lessened taxes for households in the middle quintiles. The decline in the average federal individual income tax rate since 1979 was largest for those in the lowest income quintile, primarily because of increases in the earned income tax credit.

The average federal income tax rate for the 1 percent of the population with the highest income fell in the early 1980s and then rose following enactment of the Tax Reform Act of 1986. The average tax rate for that group then fell somewhat again in the latter half of the 1980s before climbing in the 1990s. That increase reflected changes in law that raised tax rates for that group as well as rapid increases in their income, which caused their average tax rate to rise as more income was taxed in higher tax brackets. Tax rates for the highest-income households declined after 2000. The decline was especially rapid in 2003, when a reduction in the tax rate for the top tax bracket enacted in 2001 took effect and further changes in law reduced tax rates on dividends and realized capital gains.

To measure the level and change over time in the progressivity of taxes, researchers have developed various approaches to summarizing the distribution of taxes into a single number. One such approach compares the Gini indexes for before-tax and after-tax income, essentially defining progressivity as the degree to which taxes equalize the distribution of income (see Appendix B). A Gini index for after-tax income that is smaller than the

corresponding index for before-tax income indicates that the distribution of after-tax income is more equal than the distribution of before-tax income; a larger index for after-tax income than before-tax income indicates the opposite. Under this approach, the federal individual income tax was slightly more progressive in 2007 than in 1979; that tax became more progressive between 1990 and 2000 and less progressive after 2001 (see the top panel of Figure 19).

An alternative measure of progressivity compares the share of taxes with the share of income for households ranked by income. That index effectively defines progressivity as the degree to which tax payments are more concentrated than income. (A measure that only compared the shares of taxes paid across households would be an inappropriate indicator of tax progressivity because it would not account for the shares of income across households.) By that measure of tax concentration, the federal individual income tax was notably more progressive in 2007 than in 1979; it became more progressive from 1990 through 1995 and again between 2000 and 2003, and it became slightly less progressive after 2003 (see the bottom panel of Figure 19).

A Decrease in the Progressivity of Payroll Taxes. In contrast to federal individual income taxes, which are progressive over the full range of household incomes, payroll taxes are not. In 2007, payroll taxes as a share of household income ranged from 8 percent for the lowest quintile to about 9 percent for other income groups up through the 80th percentile (see the middle panel of Figure 18). Average payroll tax rates were lower for higher income groups, dropping to under 2 percent for the highest income percentile. The average rate was lower for higher income households because a large portion of their earnings were above the maximum taxable amount for Social Security payroll taxes and because a larger fraction of their household income was not from earnings and thus not subject to payroll taxes.[37]

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37. Although Social Security payroll taxes are not progressive, the program as a whole is generally thought to be progressive because the ratio of the lifetime benefits received from Social Security to the lifetime payroll taxes paid for the program is higher for people with lower lifetime earnings than for people with higher earnings. See Congressional Budget Office, *Is Social Security Progressive?* (December 2006).

Figure 19.

Indexes of the Progressivity of Federal Taxes

(Percent)
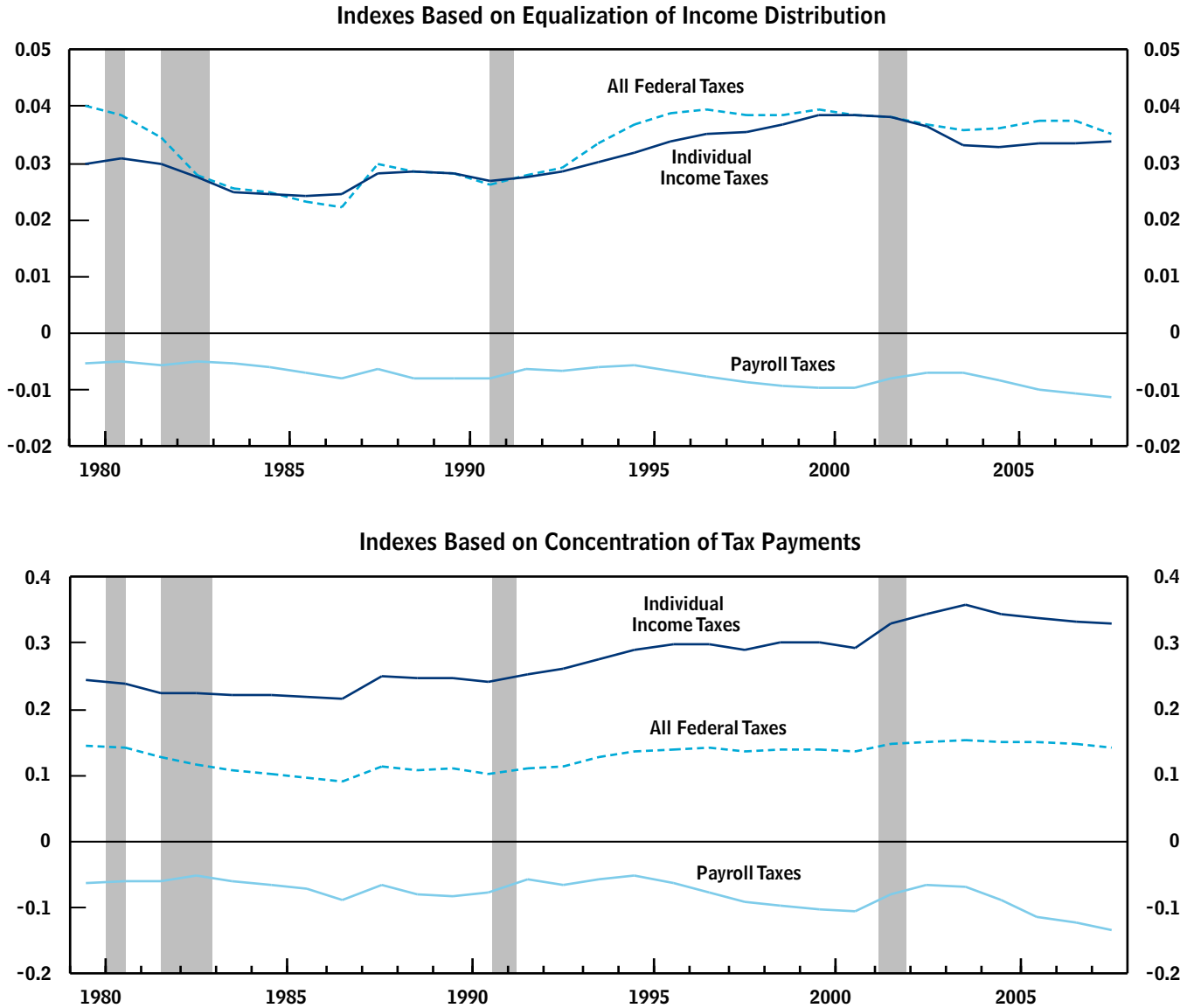
Indexes Based on Equalization of Income Distribution

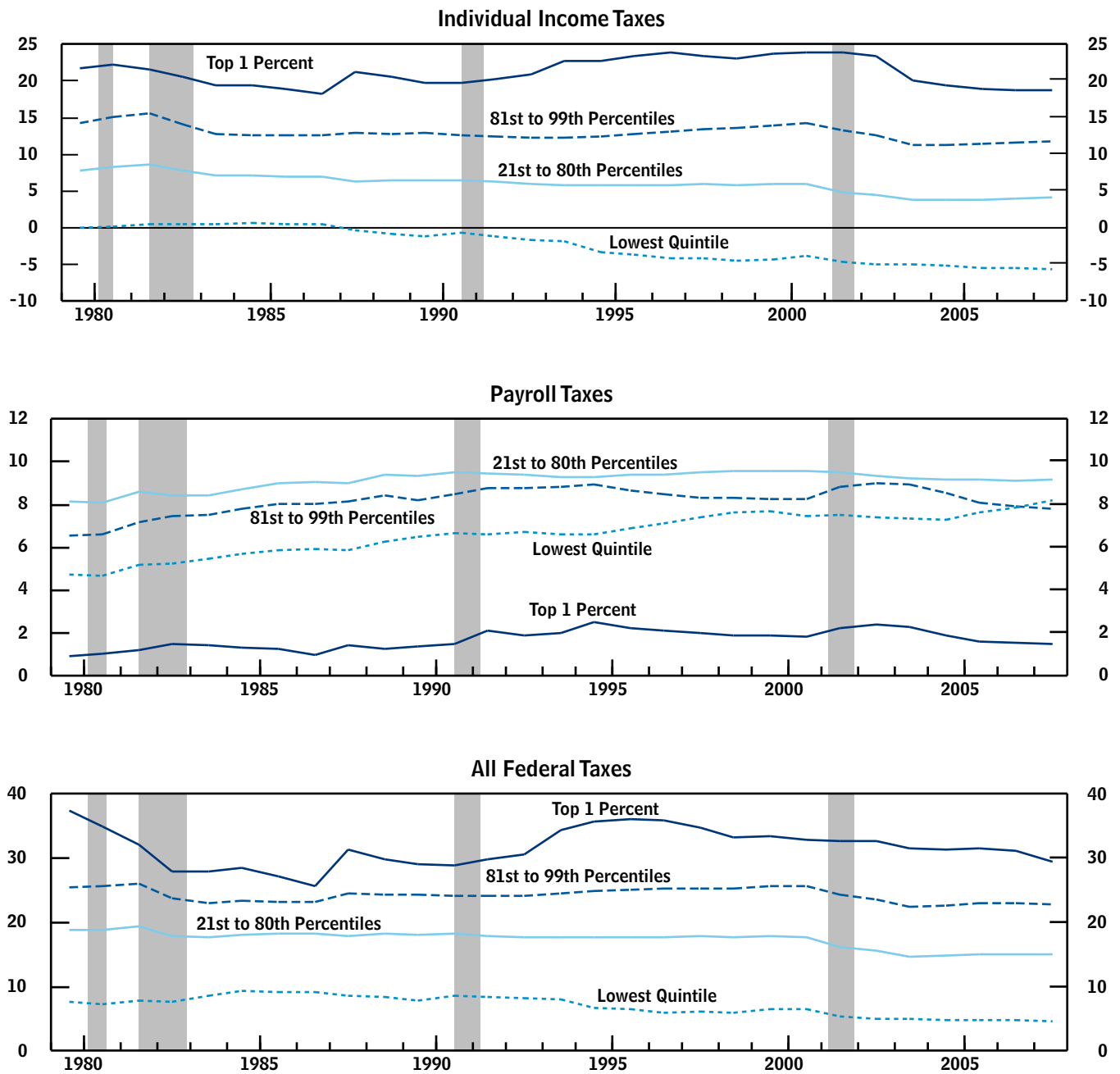### Indexes Based on Concentration of Tax Payments

Source: Congressional Budget Office.

Notes: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see ''Notes and Definitions'' at the beginning of this study.

The indexes in the top panel are calculated as the difference between the Gini indexes for income before and after federal taxes. The indexes in the bottom panel are based on a comparison of shares of federal taxes with shares of income for households ranked by income.

The average payroll tax rate rose for all income groups from 1979 through the end of the 1980s as a result of legislated increases in the tax rate and expansions in the tax base. The rate rose again for the lowest income quintile after 1993, reflecting an increased share of income from wages for that group. The payroll tax rate also rose in the early 1990s for the highest-earning taxpayers following legislated increases to the maximum taxable amount for Hospital Insurance payroll taxes, but that rate fell thereafter as total income for those taxpayers grew more rapidly than the maximum taxable amount for Social Security.

Both approaches to measuring tax progressivity indicate that payroll taxes are regressive overall. The measure that compares shares of taxes with shares of income is negative, indicating that higher-income households pay a smaller share of payroll taxes than their share of income. The measure that compares the Gini indexes for before-tax and after-tax income is also negative, indicating that income after payroll taxes is more unequally distributed than income before payroll taxes. Both measures have become more negative over time, indicating that payroll taxes have become more regressive over the 1979–2007 period. That change occurred because payroll tax rates rose the most for households at the bottom of the income distribution, as their labor income grew more rapidly than their other sources of income over the period.

The Change in the Overall Progressivity of the Federal Tax System. Taken as a whole, the federal tax system is progressive. In 2007, total federal tax rates ranged from under 5 percent of income for households in the bottom quintile to 14 percent for households in the middle quintiles to just under 30 percent for households in the highest income percentile (see the bottom panel of Figure 18).[38] From the mid-1980s through the mid-1990s, tax rates rose for the top quintile but fell for the lowest income quintile. Rates for all income groups declined from 2000 through 2007.

Because tax rates were lower for all income groups in 2007 than in 1979, it is not immediately apparent from

examining tax rates alone whether combined federal taxes became more or less progressive over that period. By the progressivity measure that compares the Gini indexes for before-tax and after-tax income, the federal tax system as a whole was slightly less progressive in 2007 than in 1979 (see the top panel of Figure 19). By that measure, combined federal taxes became much less progressive in the first part of the 1980s, much more progressive in the first part of the 1990s, and slightly less progressive since then.

By the alternative measure of tax concentration (discussed above) that compares shares of taxes with shares of income, the federal tax system as a whole was about as progressive in 2007 as it was in 1979 (see the bottom panel of Figure 19).[39] Combined federal taxes became slightly less progressive in the early 1980s and slightly more progressive in the early 1990s and have been mostly unchanged since then.

The difference in estimated changes in progressivity reflects different concepts of progressivity. Although federal tax payments were about as concentrated relative to the concentration of income in 2007 as in 1979, the equalizing effect of federal taxes on household income was smaller. That result reflects the decrease in the average tax rate over the period. If federal taxes had represented the same share of household income in 2007 as they did in 1979, the similar concentration of tax payments would have implied a similar equalizing effect.

Federal Taxes on Different Types of Households. The impact of the federal tax system varies across types of households. Some differences arise because several provisions of federal tax law explicitly provide benefits to certain types of households. For example, the child tax credit, exemptions for dependents, head of household filing status, and the earned income tax credit all reduce tax burdens on households with children relative to those without children. Other differences arise because income from various sources is more or less significant for different types of households and is taxed at different rates. For example, payroll taxes apply only to earnings (and thus are quite important to nonelderly households), whereas special tax rules apply to income from Social Security,

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38. In addition to federal individual income taxes and payroll taxes, total federal taxes include federal taxes on corporate income and federal excise taxes. Those sources accounted for 94 percent of federal receipts in fiscal year 2010. The federal estate tax, customs duties, and miscellaneous receipts are not included in the analysis.

39. A related tax progressivity index, the Suits Index, shows similar trends in tax progressivity over time.

Figure 20.

Indexes of Federal Tax Progressivity Based on Equalization of Income Distribution for Different Types of Households
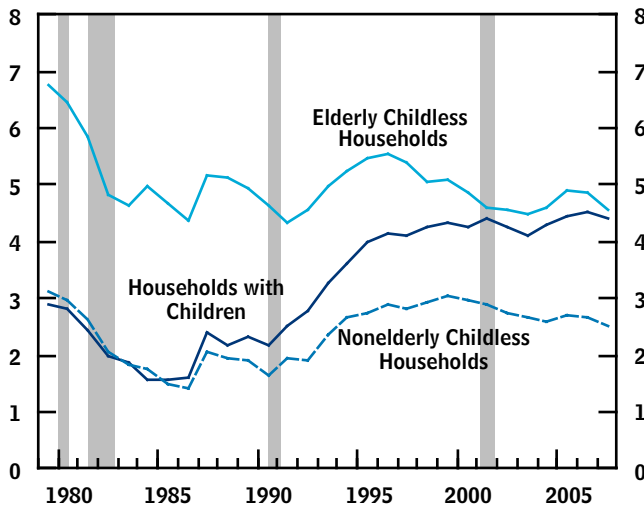
(Percentage reduction in the Gini index)

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

capital gains, and dividends (and are relatively more important to elderly households, for whom those sources represent a larger share of their income). Other differences arise because of the interaction between the distribution of income and the progressive nature of the federal tax system.

Even though elderly childless households have a lower average federal tax rate than any other group, federal taxes have a greater redistributive effect on them than on other types of households (see Figure 20). Because earnings are a relatively small source of income for elderly households, payroll tax burdens, which tend to be regressive, are low. In contrast, capital income is a more important source of income for elderly households, and federal taxes on capital income and the portion of the federal corporate tax attributed to elderly households, which are very progressive under the assumption that owners of capital bear the economic burden of corporate income taxes, are relatively high.

The redistributive effect of taxes on elderly households dropped sharply during the first five years of the time period studied here. That change was primarily driven by a decline in federal corporate income tax payments. After some variation in the interim, that effect was about the same in 2007 as it was in 1983.

For households with children, the redistributive effect of federal taxes in 2007 was almost as large as for elderly households. That progressivity derives almost exclusively from the federal individual income tax, which is most redistributive for households with children. In addition to the progressive rate structure of the tax code, the earned income tax credit and the child tax credit are very progressive, mainly benefiting low- and moderate-income households with children. Because of those credits (and the structure of tax rates), households with children in the lowest 40 percent of the overall income distribution receive more in refundable tax credits than they otherwise owe in federal income taxes, and households with children in the middle fifth of the distribution pay less than 2 percent of their income in federal individual income taxes.

The redistributive effect of federal taxes declined for households with children in the first years of the 1979–2007 period as payroll taxes rose while federal individual and corporate income taxes fell. The redistributive effect rose throughout the 1990s as a series of changes to tax law increased the concentration of federal tax payments among higher-income households. Rate increases for high-income taxpayers coupled with an expansion of the earned income tax credit and creation of the child tax credit caused the average federal individual income tax rate to decrease at the bottom of the distribution while increasing at the top. Additionally, as income rose rapidly at the top of the distribution, federal income taxes paid by those taxpayers climbed even more rapidly because of the progressive nature of the tax system. After the late 1990s, the redistributive effect of federal taxes on households with children changed little. Although the concentration of federal income tax payments continued to rise, that effect was offset by a general decline in federal taxes as a share of income.

Over most of the 29-year period, the federal tax system was least redistributive for nonelderly childless households. Those households face a similar mix of taxes as

households with children, but they face a less progressive federal income tax system. In the early years of the period, the redistributive effect of federal taxes on non-elderly childless households was almost identical to the effect on households with children. However, the increases in the concentration of federal tax payments were not nearly as large in the 1990s for this group as for households with children, because low-income childless

households did not receive new tax benefits of the same magnitude as low-income households with children. In the 2000s, the redistributive effect of federal taxes on nonelderly childless households declined slightly. The concentration of federal tax payments for such households was little changed, but federal taxes claimed a smaller share of income, causing the redistributive effect of federal taxation to decline.

Appendix A:
Measuring Household Income

This appendix explains the data and the assumptions used in this Congressional Budget Office (CBO) analysis.

Sources of Data

This analysis draws its information on income from two primary sources. The core data come from the Statistics of Income (SOI), a nationally representative sample of individual income tax returns collected by the Internal Revenue Service (IRS). The number of returns sampled grew over the time period studied, ranging from roughly 90,000 in some of the early years to more than 300,000 in the later years. CBO used the full Individual Income Tax file, which contains more detail than the public-use version of the file released by the IRS. CBO supplemented that information with data from the Annual Social and Economic Supplement to the Census Bureau's Current Population Survey (CPS), which contains survey data on the demographic characteristics and income of a large sample of households.

One limitation of the data is that both the SOI and the CPS lack important information needed for estimating and comparing after-tax household income over time. The SOI lacks information on couples and individuals who do not file a federal tax return, does not report all income from government cash transfer programs, has no information on the receipt of in-kind transfers and benefits, and uses tax returns rather than households as the reporting unit. The CPS lacks detailed information on high-income households, does not report capital gains, underreports other income from capital, and lacks information on deductions and adjustments necessary to compute taxes.

To overcome the limitations of the two data sources, CBO statistically matched each SOI record to a corresponding CPS record on the basis of demographic characteristics and income. Each pairing resulted in a new record that took on the demographic characteristics of the CPS record and the income reported in the SOI. Some types of income, such as certain transfer payments and in-kind benefits, appear only in the CPS; values for those items were drawn directly from that survey. Because not all households have to file tax returns, some households do not appear in the SOI; thus, the CPS reflects more households. After all SOI records were matched to CPS records, the remaining survey records were recorded as households that did not file an income tax return, and their income values were taken directly from the CPS. CBO then estimated the tax liability for each matched record.

Measuring Income

CBO constructed three measures of household income for this analysis:

■ The first measure—*before-transfer, before-tax household income* (called market income in this study)—includes all cash income (both taxable and tax-exempt), taxes paid by businesses (which are imputed to households as described below), and the value of income received in-kind from sources such as employer-paid health insurance premiums. The taxes paid by businesses are the imputed value of corporate income taxes (which are considered to be part of capital income) and the employer's share of payroll taxes (which are considered to be part of labor income). They are included in the measure under the assumption that household income would have been higher by a corresponding amount in the absence of those taxes.

■ The second measure—*after-transfer, before-tax household income*—adds cash transfer payments (such as Social Security, unemployment insurance, and welfare benefits) to market income, along with estimates of the value of in-kind benefits (from Medicare, Medic-

aid, the Children's Health Insurance Program (CHIP), the Supplemental Nutrition Assistance Program (formerly known as the Food Stamp program), and other programs).

■ The third measure—*after-transfer, after-federal-tax household income* (called after-tax income in this study)—subtracts federal individual and corporate income taxes, social insurance (payroll) taxes, and excise taxes. In this analysis, CBO did not subtract other federal taxes (such as estate and gift taxes) or state and local taxes in constructing after-tax income.

CBO used the Census Bureau's measure of so-called fungible value to determine the cash equivalent of in-kind government transfer payments. Fungible value is an estimate of the value to recipients of benefits received in kind. Some benefits are assessed at market value—the cost recipients would incur if they bought the goods themselves. The value assigned to food stamps, for example, equals their face value, and school meals are counted as the subsidy cost borne by the government. The value of other in-kind benefits, such as benefits paid by Medicare, Medicaid, and CHIP, equals the amount of households' resources freed up for other uses by the health care services provided, up to the average cost (total cost to the government divided by the number of program participants) of those services. Placing an appropriate value on medical insurance is difficult, however.[1] (For an extended discussion of that issue, see Appendix C.)

Adjusting Income for Differences Among Households

CBO used households as the unit of analysis. A household includes all people living in a single housing unit. The presumption is that households make joint economic decisions, which may not be true in every case (in a group house, for example). Households may comprise more than one taxpaying unit, such as a married couple and their adult children living together.

Households with identical income may differ in ways that bear on their economic status. Importantly, larger households need more income than smaller households to achieve the same economic status. At the same time, economies of scale in at least some types of consumption—housing, in particular—mean that two people do not need twice the income to live as well as an individual living alone. As a result, assessing economic status on the basis of per capita income (total household income divided by household size) ignores the benefits of shared consumption. An adjusted measure of income falling somewhere between household income and per capita income is likely to offer a better perspective on economic status. In this study, CBO adjusted for household size by dividing household income by an adjustment factor equal to the square root of the number of people in the household, counting adults and children equally. That adjustment implies that each additional person increases a household's needs but at a decreasing rate.[2]

It may also be desirable to adjust the income of households for other differences in their circumstances that affect their economic position. For example, the prices of goods and services vary among locations, and households can incur different costs associated with working, such as the costs of commuting and child care expenses, depending on how many members are employed. In this analysis, CBO did not adjust for those additional differences among households.

Income Categories

In this analysis, CBO presents data on income and taxes for various subgroups of the population, such as the lowest 20 percent or the top 1 percent. In constructing those subgroups, households are ranked by income that is adjusted for household size. Each subgroup of the population contains an equal number of people, but because households vary in size, subgroups generally contain unequal numbers of households.

For each of the years 1979 through 2007, Table A-1 presents the range of income in each income category for the

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1. See Daniel H. Weinberg, "Income Data Quality Issues in the Annual Social and Economic Supplement to the Current Population Survey" (paper prepared for the American Enterprise Institute–University of Maryland Seminar on Poverty Measurement, October 12, 2004).

2. For example, a household consisting of a married couple with two children with income of $80,000 would have an adjusted income of $40,000 ($80,000 divided by $\sqrt{4}$) and would have the equivalent economic ranking of a single person with income of $40,000 or a married couple with income of about $56,600 ($56,600 divided by $\sqrt{2}$ is approximately $40,000). See Constance F. Citro and Robert T. Michael, eds., *Measuring Poverty: A New Approach* (Washington, D.C.: National Academy Press, 1995).

Table A-1.

Income Category Minimums, 1979 to 2007

(2007 dollars)

Year	Lowest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	81st-90th Percentiles	91st-95th Percentiles	96th-99th Percentiles	Top 1 Percent
				Market Income				
1979	0	12,823	25,095	36,165	51,289	66,177	84,243	165,049
1980	0	11,679	23,884	34,837	49,952	65,052	82,035	160,192
1981	0	11,576	23,775	34,962	50,269	64,931	82,417	157,184
1982	0	10,942	22,676	34,161	49,966	65,043	81,463	157,152
1983	0	10,588	22,368	34,124	50,333	66,092	83,946	164,076
1984	0	11,575	23,811	35,804	52,660	69,339	88,492	176,324
1985	0	11,731	23,996	36,388	53,439	70,645	90,614	182,408
1986	0	11,674	24,431	37,502	55,851	73,994	96,189	211,734
1987	0	10,917	24,247	37,880	56,609	75,078	96,583	198,913
1988	0	11,269	24,935	38,524	57,719	76,637	99,333	214,137
1989	0	11,643	25,273	39,082	58,173	77,769	101,227	217,203
1990	0	12,022	25,198	38,384	57,464	76,458	99,457	207,178
1991	0	11,591	24,259	37,979	56,428	75,209	97,958	203,670
1992	0	11,028	24,098	38,111	57,027	76,416	100,258	215,111
1993	0	11,013	23,939	38,046	57,398	76,678	100,620	211,008
1994	0	11,183	24,341	38,952	58,474	78,114	102,425	218,209
1995	0	12,218	25,307	39,612	59,901	80,381	106,301	230,851
1996	0	12,181	25,445	40,083	60,965	82,462	109,621	244,785
1997	0	12,716	26,091	40,942	62,189	85,783	115,270	259,427
1998	0	13,780	27,130	42,515	64,940	88,854	120,428	277,770
1999	0	14,258	27,836	43,578	66,755	91,542	123,864	296,430
2000	0	13,930	27,539	43,729	67,308	93,072	127,167	304,593
2001	0	13,563	27,273	43,003	66,512	90,969	122,144	274,135
2002	0	12,992	26,145	41,757	64,760	88,819	118,862	259,846
2003	0	12,536	25,934	41,896	65,567	89,789	120,573	265,390
2004	0	12,847	26,727	42,855	67,083	92,368	124,797	288,190
2005	0	13,415	26,993	43,464	68,025	95,001	131,128	322,859
2006	0	13,563	27,215	44,070	69,314	96,786	133,961	337,634
2007	0	14,851	28,618	45,192	70,578	98,955	137,578	347,421

Continued

three income definitions that CBO uses in the study: market income, market income plus government transfers, and market income plus government transfers minus federal taxes.

Incidence of Federal Taxes

CBO assumed that households bear the economic cost of the taxes they pay directly, such as individual income taxes and the employee's share of payroll taxes. CBO further assumed—as do most economists—that the employer's share of payroll taxes is passed on to employees in the form of lower wages than would otherwise be paid. Therefore, CBO included the amount of those taxes in labor income and counted the taxes as part of household taxes.

CBO also assumed that the economic costs of excise taxes fall on households according to their consumption of taxed goods (such as tobacco and alcohol). Excise taxes on intermediate goods, which are paid by businesses, were attributed to households in proportion to their overall consumption. CBO assumed that each household spends the same amount on taxed goods as a similar household with comparable income in the Bureau of Labor Statistics' Consumer Expenditure Survey.

In this analysis, CBO assumed that owners of capital bear the economic burden of corporate income taxes in proportion to their income from capital, measured as interest, dividends, rents, and adjusted capital gains. Adjusted capital gains—capital gains scaled to their long-term historical level given the size of the economy and the tax rate that applies to them—were used in place of actual

Table A-1.   **Continued**

Income Category Minimums, 1979 to 2007

(2007 dollars)

Year	Lowest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	81st–90th Percentiles	91st–95th Percentiles	96th–99th Percentiles	Top 1 Percent
				Market Income Plus Transfers				
1979	0	17,394	27,563	37,861	52,803	67,496	85,634	167,365
1980	0	16,705	26,678	36,781	51,554	66,629	83,706	162,320
1981	0	16,473	26,487	36,988	51,982	66,629	84,379	159,784
1982	0	15,988	25,825	36,465	51,956	66,987	83,800	160,358
1983	0	15,295	25,557	36,462	52,283	67,737	85,748	167,000
1984	0	16,229	26,665	38,092	54,437	71,307	90,473	178,821
1985	0	16,304	27,093	38,689	55,204	72,538	92,686	185,834
1986	0	16,492	27,860	39,931	57,618	75,888	98,436	215,506
1987	0	15,897	27,719	40,223	58,387	76,969	98,368	202,586
1988	0	16,332	28,347	41,006	59,510	78,824	101,171	217,957
1989	0	16,720	28,774	41,448	60,316	79,959	103,537	220,654
1990	0	17,116	28,809	41,199	59,485	78,614	101,968	210,743
1991	0	17,055	28,286	40,786	58,597	77,401	100,232	206,690
1992	0	16,667	28,369	41,135	59,323	78,808	103,311	218,623
1993	0	16,899	28,483	41,075	59,840	79,225	103,024	215,061
1994	0	17,077	28,896	42,051	60,718	80,455	105,247	221,474
1995	0	17,916	29,893	42,762	62,352	83,317	109,400	235,420
1996	0	17,622	30,179	43,391	63,557	85,572	112,829	248,706
1997	0	18,076	30,591	44,069	65,054	88,139	118,285	263,875
1998	0	18,918	31,736	45,626	67,561	91,954	123,395	281,724
1999	0	19,402	32,444	46,610	69,545	94,613	127,211	300,386
2000	0	19,030	32,219	46,880	70,279	96,330	130,399	308,989
2001	0	19,204	32,352	47,091	69,709	93,970	125,600	278,582
2002	0	18,745	31,526	46,069	68,029	91,974	122,069	265,040
2003	0	18,461	31,317	46,034	68,999	92,732	123,655	269,239
2004	0	18,852	32,089	47,331	70,639	95,934	128,279	293,352
2005	0	19,092	32,632	48,109	71,740	98,573	135,153	327,829
2006	0	19,466	32,999	48,760	73,172	100,851	138,171	341,717
2007	0	20,448	34,261	49,960	74,732	102,918	141,914	352,875

Continued

realizations in allocating corporate income taxes so as to smooth out large year-to-year variations in the amount of gains.

The incidence of the corporate income tax is uncertain. In the very short term, owners of corporate equity are likely to bear most of the economic burden of the tax; but over the longer term, as capital markets adjust, the economic burden of the tax is spread across owners of all types of capital. Moreover, the burden will fall partly on wage earners to the extent that domestic investment declines as capital shifts to other countries or domestic saving falls because of the tax, thereby lowering the growth in workers' productivity and wages. For this analysis, however, CBO assumed that the economic burden of the corporate income tax is spread proportionately across all forms of capital income.[3]

State and Local Taxes

CBO did not include state and local taxes in this analysis because of the difficulty of estimating them for individual households over a long period. State sales taxes would be

3. See Jane G. Gravelle and Kent A. Smetters, "Does the Open Economy Assumption Really Mean That Labor Bears the Burden of a Capital Income Tax?" *Advances in Economic Analysis & Policy*, vol. 6, no. 1, Article 3 (2006); Alan J. Auerbach, "Who Bears the Corporate Tax? A Review of What We Know," in James M. Poterba, ed., *Tax Policy and the Economy*, vol. 20 (Cambridge Mass.: MIT Press, 2006), pp. 1–40; William M. Gentry, *A Review of the Evidence on the Incidence of the Corporate Income Tax*, Office of Tax Analysis Paper 101, Washington, D.C., 2007; William C. Randolph, *International Burdens of the Corporate Income Tax*, Congressional Budget Office Working Paper 2006-09 (August 2006); and Jennifer C. Gravelle, *Corporate Tax Incidence: Review of General Equilibrium Estimates and Analysis*, Congressional Budget Office Working Paper 2010-03 (May 2010).

Table A-1.   **Continued**

Income Category Minimums, 1979 to 2007

(2007 dollars)

Year	Lowest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	81st-90th Percentiles	91st-95th Percentiles	96th-99th Percentiles	Top 1 Percent
			Market Income Plus Transfers Minus Federal Taxes					
1979	0	15,411	22,851	30,341	41,075	51,613	64,087	115,965
1980	0	14,763	22,065	29,416	39,920	50,418	62,330	113,485
1981	0	14,421	21,748	29,287	39,910	50,181	62,291	113,396
1982	0	14,036	21,540	29,331	40,595	51,520	63,965	118,782
1983	0	13,450	21,280	29,494	41,196	52,721	66,334	126,542
1984	0	14,057	22,079	30,652	42,868	55,152	69,345	135,171
1985	0	14,133	22,375	31,127	43,492	56,152	71,338	140,576
1986	0	14,344	22,979	32,184	45,308	58,646	75,957	162,699
1987	0	13,988	23,038	32,620	45,809	58,970	74,477	146,992
1988	0	14,342	23,453	33,094	46,544	60,453	77,074	158,133
1989	0	14,787	23,862	33,464	47,043	61,294	78,824	161,594
1990	0	14,953	23,848	33,248	46,352	60,430	77,416	154,120
1991	0	14,948	23,517	33,019	45,844	59,475	75,790	149,975
1992	0	14,751	23,726	33,299	46,480	60,648	78,412	158,908
1993	0	14,964	23,843	33,315	46,918	60,910	77,833	152,493
1994	0	15,296	24,190	34,089	47,474	61,601	79,057	154,622
1995	0	16,037	24,958	34,748	48,659	63,435	81,445	163,944
1996	0	15,893	25,143	35,305	49,592	64,996	83,950	172,247
1997	0	16,253	25,486	35,824	50,788	67,026	87,885	182,804
1998	0	17,036	26,721	37,301	52,966	69,883	91,840	195,771
1999	0	17,416	27,273	38,104	54,210	71,591	94,559	207,060
2000	0	17,084	27,244	38,320	54,784	72,857	96,771	214,484
2001	0	17,575	27,805	39,077	55,265	72,214	94,576	196,355
2002	0	17,319	27,251	38,448	54,350	71,416	92,455	188,133
2003	0	17,272	27,476	38,962	55,963	73,134	95,450	193,457
2004	0	17,620	28,161	39,984	57,337	75,357	98,628	210,028
2005	0	17,837	28,538	40,556	58,141	77,579	103,490	231,481
2006	0	18,141	28,816	41,083	59,264	79,165	105,716	242,390
2007	0	18,979	29,769	42,202	60,557	81,135	109,006	252,607

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes,
see "Notes and Definitions" at the beginning of this study.

particularly challenging, as no major survey collects data on sales taxes paid by households. It is unclear how the omission of those taxes affects conclusions about trends in the redistributive effect of the entire tax system.

Between 1979 and 2007, state and local taxes ranged between 8.2 percent and 9.3 percent of gross domestic product—equal to about 40 percent to 50 percent of federal taxes. State and local taxes have three primary components, and the composition of receipts has been fairly stable over time. Sales taxes are the largest source, accounting for 34 percent of state and local tax revenue in 2007. Those taxes are generally assumed to be roughly proportional to consumption, making the tax regressive with respect to income (because lower-income

households consume a greater proportion of their income than do higher-income households). Property taxes accounted for 30 percent of state and local tax revenue in 2007. The progressivity of those taxes depends critically on their incidence, which is a matter of considerable debate. State individual income taxes, which accounted for 22 percent of state and local tax revenues in 2007, are much less progressive than the federal individual income tax because the rate structures for state-level income taxes are flatter than those at the federal level and any refundable credits are small. Thus, although different analysts have reached different conclusions about whether state and local taxes on net are proportional, progressive, or regressive, they are clearly less progressive than the federal tax system. Consequently, analysis of the entire tax system

would show less progressivity than analysis of the federal tax system alone. However, it is more difficult to know how changes in state and local taxes over time have affected trends in tax progressivity.[4]

Limitations of Using Annual Data

This study presents a series of annual snapshots of household income from 1979 through 2007. Because the data represent the experiences of different people in each year, the analysis does not provide information about changes in the income of a particular household or a group of households over multiyear periods.

That approach has two significant limitations. First, the year-to-year variation in income means that a household's distributional rank based on annual income may not accurately represent its economic resources; for example, a household in one of the lower income quintiles in a particular year may have assets that make it relatively well

off. A household's consumption derives less from its current income than from the normal, or permanent, income the household expects to have over time. People may rely on savings or borrowing to tide themselves over during periods of unemployment, for example.

A second, and related, limitation is that some forms of income come irregularly, particularly capital gains from the sale of a business, shares of stock, or other assets. A business owner who sells his firm, for example, will appear wealthy in the year of the sale because of the large capital gain realized at that time, even though the increase in the firm's value probably accrued over a much longer period. Placing that person near the top of the income distribution in the year of the sale and at a much lower rank in other years misstates his or her economic status in all years, overstating it in one and understating it in all others. Yet in the absence of lifetime income data, it is impossible to accurately apportion the capital gains realized in a single year over multiple years. Analysts must choose between counting the gain as income when realized or allotting only part or none of it to current income. Extensive examination of tax data on the sales of capital assets indicates that apportioning gains across years on the basis of a single year's realizations would lead to significant error.[5] CBO thus counted all capital gains as income when realized.

4. For distributional analyses of state and local tax systems, see Joseph A. Pechman, *Who Paid the Taxes: 1966–85?* (Washington, D.C.: Brookings Institution, 1985); and Donald Phares, *Who Pays State and Local Taxes?* (Cambridge, Mass.: Oelgeschlager, Gunn, and Hain, 1980). For more-recent estimates, see Andrew Chamberlain and Gerald Prante, *Who Pays Taxes and Who Receives Government Spending? An Analysis of Federal, State, and Local Tax and Spending Distributions, 1991–2004*, Working Paper 1 (Washington, D.C.: Tax Foundation, March 22, 2007); and Institute on Taxation and Economic Policy, *Who Pays? A Distributional Analysis of the Tax Systems in All 50 States* (November 2009).

5. See Congressional Budget Office, *Perspectives on the Ownership of Capital Assets and the Realization of Capital Gains* (May 1997).

Appendix B:
Inequality Indexes

This Congressional Budget Office (CBO) analysis uses several indexes to measure the distribution of income and taxes. Those indexes are derived from concentration curves, which generally plot the cumulative distribution of income or taxes against the cumulative distribution of the population. This appendix provides information on the calculation and interpretation of those indexes.

The Gini Index

The Gini index is a widely used measure of income inequality. It ranges from zero to one, with increasing values of the index implying greater inequality.[1] The index provides a useful summary metric, characterizing the entire income distribution with a single number. The Gini index can be derived from data on the shares of income accruing to various income groups. (See Box 2 on page 8 for more discussion about deriving the index.)

One way to put the Gini index in context is to examine a shift in income shares that produced a particular change in the Gini index. For example, in 2007 the system of government transfers and federal taxes increased the share of income accruing to each of the bottom four quintiles of the population (a quintile is one-fifth of a distribution) by 1 or 2 percentage points (relative to their share of market income) while reducing the share accruing to the highest quintile by around 7 percentage points. Much of that reduction came from the top percentile, whose share of income shrank by 4 percentage points. Those shifts in income shares caused a difference of almost 11 percentage points in the Gini index: The Gini index for market

income was 0.590, and the Gini index for after-tax income was 0.483.

Another way to put the Gini index in context is to see the impact that hypothetical income shifts would have on that measure. Shifting money from lower-income groups to higher-income groups would cause the index to rise, whereas shifts from higher- to lower-income groups would cause it to fall. Shifts across large ranges of the income distribution would have a bigger effect on the index than shifts across smaller ranges. A shift of 1 percent of market income from the top percentile of the income distribution to the bottom quintile would lower the Gini index by 0.018 (see Table B-1). That shift, of roughly $95 billion (in 2007 dollars), would reduce income in the highest percentile by about 5 percent but would boost income in the bottom quintile by almost 50 percent. Making that same size shift from the top percentile to the middle quintile would reduce the Gini index by 0.010, and shifting it instead to the 95th to 99th percentiles would lessen the index by only 0.001 percentage point. Shifting 1 percent of income from the middle quintile to the lowest quintile would reduce the index by 0.008, while shifting it to the highest quintile would raise the index by 0.009. Shifting that money from the lowest quintile to the middle or highest quintile would boost the index by 0.008 or 0.017, respectively.

A further way of interpreting the Gini index is as a statistical measure of the dispersion of the income distribution, similar to a standard deviation. In particular, the Gini index can be interpreted and calculated as half of the relative mean difference. The relative mean difference, in turn, is equal to the average difference in income between every pair of households in the population, expressed as a percentage of average income. So the Gini index of 0.590

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1. Researchers have developed several other inequality indexes. For a comparison of the properties of different measures, see Frank A. Cowell, *Measuring Inequality* (New York: Oxford University Press, 2011).

Table B-1.

Effect of Hypothetical Transfers on the Gini Index

Hypothetical Transfer	Change in Gini Index
Moving 1 Percent of Income from Top Percentile to:	
Lowest quintile	-0.018
Middle quintile	-0.010
95th-99th percentiles	-0.001
Moving 1 Percent of Income from Middle Quintile to:	
Lowest quintile	-0.008
Highest quintile	0.009
Moving 1 Percent of Income from Lowest Quintile to:	
Middle quintile	0.008
Highest quintile	0.017
Memorandum:	
Gini Index for Market Income in 2007	0.590

Source: Congressional Budget Office.

Note: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

for market income implies that the average income difference across pairs of households was equal to 118 percent (2 times 0.590) of average household market income, or roughly $66,600. In contrast, the index for after-tax income was 0.483, so the average difference between all households was equal to 97 percent of average after-tax income, or about $47,900.

Income Concentration Indexes

Concentration indexes are similar to the Gini index, expressing the concentration of each income source as a single number. A concentration index differs from a Gini index for each source because in calculating the concentration index, households are ranked by total market income rather than by income from that source, as they would be in calculating the Gini index. The concentration index captures two effects: the concentration of income from that source, and the correlation of that income source with income from other sources (and hence with total market income). The latter effect arises because households are sorted by total market income when computing the metric. Thus, for example, the concentration index for labor compensation has increased

over time both because compensation has become more unevenly distributed in favor of higher-compensation households and because compensation has become more highly correlated with other unevenly distributed sources of income, such as capital income.

Decomposing the Gini Index by Income Source

To calculate the Gini index G for total income Y, CBO used a standard formula:

$$G(Y) = \frac{2}{N^2 \bar{Y}} \times \sum_{i=1}^{N} \left(i - \frac{N+1}{2} \right) \times Y_i \qquad (1)$$

Where i is the index for each household ranked by total income, Y, from 1 to N.

Other formulas for estimating the Gini index, such as one based on the covariance of income with the cumulative distribution function of income, yield identical estimates.

The Gini index for total income can be decomposed into contributions from each income source.[2] The decomposition used in this analysis is:

$$G(Y) = \sum_{j=1}^{J} \frac{\bar{y}_j}{\bar{Y}} \times \overline{G}(y_j) \qquad (2)$$

Where:

j is the index for each income source, from 1 to J;

y_j is the income from each source;

$\bar{y}_j$ is the average amount of income from each source;

$\bar{Y}$ is the average amount of total income;

$\frac{\bar{y}_j}{\bar{Y}}$ is the share of total income accounted for by each income source; and

2.   This derivation is reported in A.F. Shorrocks, "Inequality Decomposition by Factor Components," *Econometrica,* vol. 50, no. 1 (January 1982), pp. 193–211; and John C. H. Fei, Gustav Ranis, and Shirley Kuo, "Growth and the Family Distribution of Income by Factor Components," *Quarterly Journal of Economics,* vol. 92, no.1 (February 1978), pp. 17–53.

$\overline{G}(y_j)$ is the concentration index for each income source (sometimes called the pseudo-Gini).

Changes in the share of total income accounted for by each income source are reported in the main text as shifts among sources of income. The pseudo-Gini differs from the conventional Gini for the income source because individuals are ranked by total income rather than income from that source. Changes in the pseudo-Gini are reported as an increased concentration of the income source. That term will rise if an income source becomes more concentrated higher in the distribution of total income, which occurs if the source becomes more concentrated by itself or if income from that source becomes closely correlated with income from other sources.

$\overline{G}(y_j)$ can be written as:

$$\overline{G}(y_j) = \frac{2}{N^2 \bar{y}_j} \times \sum_{i=1}^{N} \left(i - \frac{N+1}{2} \right) \times y_{ij} \qquad (3)$$

CBO's decomposition can be mathematically derived from the three-factor decomposition used by some researchers.[3] That decomposition divides the Gini into three components, using the covariance formula for the Gini coefficient:

$$G(Y) = \sum_{j=1}^{J} \frac{cov(y_j, F(Y))}{cov(y_j, F(Y_j))} \times \frac{2cov(y_j, F(y_j))}{\bar{y}_j} \times \frac{\bar{y}_j}{\bar{Y}} \qquad (4)$$

Where F is the cumulative distribution function of income.

The first term is called the Gini correlation; it measures how closely the distribution of income from each income source aligns with the distribution of total income. The second term is the pure Gini for each income source, and the third term is a weight for each income source, equal to its share of total income.

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3. See Robert I. Lerman and Shlomo Yitzhaki, "Income Inequality Effect by Income Source: A New Approach and Applications to the United States," *Review of Economics and Statistics*, vol. 67 (1985), pp. 151–156.

CBO's approach essentially combines the first two terms into one factor. Multiplying the first two terms together yields:

$$G(Y) = \sum_{j=1}^{J} \frac{2cov(y_j, F(Y))}{\bar{y}_j} \times \frac{\bar{y}_j}{\bar{Y}} \qquad (5)$$

The first term equals the concentration index for each income source when households are ranked by their total income. It differs from the second term of the previous equation in that the numerator is the covariance of income from source j with the cumulative distribution function of total income Y rather than income source $j(y_j)$.

Tax Progressivity Indexes

Several indexes have been devised to summarize the progressivity of a tax system. Those indexes rely on so-called Lorenz-type concentration curves to summarize the distribution of the tax system in a single number.

One such measure, known as the Reynolds-Smolensky index, is equal to the difference between the Gini index for before-tax income and the Gini index for after-tax income. If the tax system is proportional (each household pays the same share of income in taxes), then the Gini indexes for before- and after-tax income are identical, and the Reynolds-Smolensky index takes on a value of zero. If the tax system is progressive (average tax rates rise with income), then the Gini index for after-tax income is smaller than the Gini index for before-tax income, and the Reynolds-Smolensky index takes on a positive value.

Another measure, the Kakwani index, is computed as the difference between a concentration index for tax payments (with households ordered by their before-tax household income) and the Gini coefficient for before-tax income. If the tax system is proportional, then the tax concentration index exactly equals the Gini index for before-tax income, and the Kakwani index takes on a value of zero. If the tax system is progressive, then the Kakwani index has a positive value; and if the tax system is regressive, then the Kakwani index has a negative value.

Although both of those indexes measure the progressivity of the tax system, they do so in different ways, which can

lead to different conclusions about that progressivity. The Kakwani index directly measures the concentration of tax payments, comparing that with the concentration of income. The index is thus indifferent to the size of the tax system, viewing the progressivity of the tax system on the basis of the shares of taxes paid and the shares of income received by different income groups. By contrast, the Reynolds-Smolensky index only indirectly measures the concentration of payments, by comparing the distribution of after-tax income to before-tax income. That formula measures the redistributive effect of the tax system, and it is a function of both the concentration of tax payments and the share of household income claimed by the tax system.[4] Those two measures can yield different conclusions about the change in progressivity induced by a change in the tax code.

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4. In fact, the indexes can be mathematically derived from each other primarily on the basis of the average tax rate. The Reynolds-Smolensky index is equal to the Kakwani index multiplied by the inverse of the after-tax rate, plus an adjustment for the difference between the before-tax and after-tax income rankings. See John Creedy, "Taxation Redistribution and Progressivity: An Introduction," *Australian Economic Review,* vol. 32, no. 4 (December 1999), pp. 410–422.

Appendix C:
The Effect of Health Insurance on the Distribution of Income

Health insurance represents a significant and growing portion of labor compensation and government transfer payments. Employer-sponsored health insurance (ESI) is the largest component of nonwage compensation provided to workers, and the Medicare and Medicaid programs are two of the largest federal transfer programs. Because receiving health insurance allows households to consume more health care without giving up other forms of consumption, the Congressional Budget Office (CBO) included estimated values of that insurance in household income for this study. Many analyses of household income do not include health insurance, however, at least in part because assigning a value to it is difficult.

This appendix shows how including health insurance affected the estimates of income inequality presented in this study and how valuing Medicare, Medicaid, and the Children's Health Insurance Program (CHIP) in a different way would have led to different estimates. Under either approach to valuing those government transfers, including health insurance in income reduces measured income inequality and the measured increase in inequality between 1979 and 2007.

Assigning a Value to Health Insurance

Receiving health insurance enhances the economic well-being of recipients, enabling them to obtain health care services at a reduced out-of-pocket cost. But recipients of health insurance might prefer to receive a cash pay-ment equal to the employer's or government's cost of that insurance because then they could choose whether to use all of that cash payment to purchase insurance on their own or to use some or all of the cash payment for other purposes. Therefore, the value of the health insurance to a recipient might be lower than the cost of providing it, particularly for low-income recipients, whose consumption of other goods and services is tightly constrained by their lack of resources.

In the main analysis of this study, CBO counted the full value of health insurance premiums paid by employers as income.[1] However, CBO counted only the so-called fungible value of Medicare, Medicaid, and CHIP as income. That measure, developed by the Census Bureau and used in some of its income definitions, equals the amount of resources freed up for other uses by that insurance, up to the average cost of those services (total cost to the government divided by the number of program participants). The fungible value of Medicare, Medicaid, and CHIP for a household thus depends not only on the average cost of the benefits provided by those programs but also on the

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1. The Census Bureau estimates the value of employers' contributions to health insurance on the basis of a separate survey of employers. A full description of the methods used to value non-cash benefits is provided in Appendix B of Bureau of the Census, *Measuring the Effect of Benefits and Taxes on Income and Poverty: 1992*, Current Population Reports, Series P60, No. 186RD (September 1993), pp. viii-ix and B-1 to B-5.

income and needs of the household.[2] This appendix also shows results using the average cost of Medicare, Medicaid, and CHIP rather than the fungible value.

Evaluating the Impact on Income Inequality

Two recent papers have directly examined how the treatment of health insurance affects the measurement of income inequality.[3] In one analysis, Gary Burtless and Pavel Svaton used estimates of the value of health insurance from the Current Population Survey (CPS) and the value of health care services consumed from the Medical Expenditure Panel Survey (MEPS) over the 1996–2005 period. Using the CPS-based measures of health insurance, the authors found that the inclusion of that insurance raised average income by about 8 percent in the first half of that period and by more than 10 percent in the latter half of the period. The relative increases in income were larger in the lower part of the income distribution than in the higher part, so the inclusion of health insurance reduced measured income inequality. The authors also found that including health insurance led to a slower measured increase in income inequality over time. Moreover, the authors found similar effects on inequality when they included the MEPS-based measures of health care consumption in income instead of the CPS-based measures of health insurance.

Richard Burkhauser and Kosali Simon undertook a similar analysis, supplementing income from the CPS with insurance imputations from the MEPS. Specifically, the

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2. For each household, the Census Bureau compares the household's income to an estimate of the cost to the household of meeting basic needs for food and housing. If a household does not have enough income to meet those basic needs, the Census Bureau assumes that the household would spend nothing on health care in the absence of the government transfer programs, and it sets the fungible value for health care benefits for that household equal to zero. For households with some income above what is necessary to meet basic needs, the fungible value is set equal to the amount of income above that basic standard, up to the average cost of the health care benefits. The Census Bureau estimates the average cost of health care benefits using outlays for Medicare, Medicaid, and CHIP by state and risk class.

3. See Gary Burtless and Pavel Svaton, "Health Care, Health Insurance, and the Distribution of American Incomes," *Forum for Health Economics & Policy,* vol. 13, no. 1 (Frontiers in Health Policy Research), Article 1; and Richard V. Burkhauser and Kosali I. Simon, *Measuring the Impact of Health Insurance on Levels and Trends in Inequality,* Working Paper 15811 (Cambridge, Mass.: National Bureau of Economic Research, March 2010).

authors used the MEPS data to construct measures of the insurance value of health insurance rather than using the actual heath care services consumed. They found that including employer-sponsored health insurance in income reduced measured income inequality and the measured increase in income inequality over time. They also found that including the government-provided health insurance programs had an even greater effect on reducing both the level and increase in income inequality.

Employer-Sponsored Health Insurance

Consistent with the results presented in those two papers, CBO found that including employer-sponsored health insurance in income slightly lowered measured inequality and the measured increase in inequality between 1979 and 2007.

Employer-sponsored health insurance provides the biggest proportional boost to income in the middle of the distribution, with a smaller boost at both extremes of the distribution. At the bottom of the income distribution, households are unlikely to have ESI, either because they are not working or because they are employed in jobs that do not offer it. At the top of the income distribution, high-income workers are quite likely to receive ESI, but because the average costs of health insurance do not rise proportionally with income, ESI is a relatively small part of their compensation. Therefore, in 2007, households in the lowest income quintile (or fifth of the distribution) received only 2.2 percent of the total value of ESI, whereas those in the middle quintile received 19.5 percent, and households in the highest quintile received 40 percent (see Table C-1). That insurance represented 1.4 percent of income in the lowest quintile, between 6 percent and 7 percent of income in the middle three quintiles, and declining shares of income moving up within the top quintile to only 0.5 percent of income for the top percentile (see Table C-2).

The Gini index for market income (including ESI) was slightly below that of other market income, indicating more equality (see Figure C-1 on page 47). That small net effect masks distributional shifts, however. Adding ESI to other income increased income in the middle of the distribution by more than at either end of the distribution. The equalizing effect of increasing income in the middle of the distribution more than at the top was slightly larger than the disequalizing effect of increasing income in the middle more than at the bottom, so the net effect was slightly equalizing. The equalizing effect of

Table C-1.

Shares of Selected Income Measures, by Income Group, 1979 and 2007

(Percent)

	Market Income, Excluding Health Insurance	Employer-Sponsored Health Insurance	Medicare		Medicaid and CHIP		ESI Plus Fungible Value of Medicare, Medicaid, and CHIP
			Average Cost	Fungible Value	Average Cost	Fungible Value	
1979							
Lowest Quintile	7.7	2.9	57.5	47.7	73.5	56.8	19.0
Second Quintile	10.9	13.3	16.6	20.3	14.2	23.9	16.0
Middle Quintile	14.8	20.4	9.0	11.0	5.6	9.1	17.0
Fourth Quintile	21.1	27.3	7.2	8.8	3.7	5.7	20.7
80th–90th Percentiles	14.7	17.1	3.6	4.2	1.2	2.3	12.6
90th–95th Percentiles	9.8	10.0	2.0	2.3	0.6	1.1	7.3
95th–99th Percentiles	11.6	7.5	2.7	3.4	0.6	1.1	5.9
Top 1 Percent	9.6	1.7	1.3	1.7	0	0	1.6
All Quintiles	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2007							
Lowest Quintile	5.7	2.2	46.1	30.1	64.6	31.5	15.5
Second Quintile	8.6	10.1	20.2	25.1	18.1	33.0	17.8
Middle Quintile	12.7	19.5	13.7	18.1	8.7	17.6	18.8
Fourth Quintile	18.6	28.2	9.5	12.7	4.9	10.4	20.7
80th–90th Percentiles	13.6	18.2	4.4	5.8	2.0	3.7	12.2
90th–95th Percentiles	9.8	10.6	2.5	3.4	0.9	1.5	7.0
95th–99th Percentiles	13.0	8.9	2.7	3.6	0.8	1.5	6.2
Top 1 Percent	18.6	2.3	0.9	1.2	0.2	0.5	1.7
All Quintiles	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Congressional Budget Office.

Notes: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

CHIP = Children's Health Insurance Program; ESI = employer-sponsored health insurance.

ESI has increased a bit over time, in large part because the amount spent on employer-sponsored health insurance has grown faster than other market income.

Medicare, Medicaid, and CHIP

Including receipt of Medicare, Medicaid, and CHIP significantly reduces income inequality because the beneficiaries of both programs are disproportionately represented in the lower part of the income distribution. Only families with income below specified levels are eligible for Medicaid, so very little of the program's impact is on the upper reaches of the income distribution. CHIP also has income limits, though they are generally higher than the limits for Medicaid. In 2007, when measuring Medicaid and CHIP benefits by their average cost, about 65 percent of the benefits accrued to the lowest income quintile and about 18 percent accrued to the second quintile (see Table C-1).[4] The fungible value of Medicaid and CHIP is constructed by the Census Bureau to be less than or equal to the average cost of the benefits, and the difference relative to average cost tends to be greatest for households that have the lowest incomes. Consequently,

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4. The Census Bureau combines its estimates of the value of Medicaid and CHIP benefits, so CBO did not analyze those programs separately.

Table C-2.

Health Insurance as a Share of Market Income, by Income Group, 1979 and 2007

(Percent)

	Employer-Sponsored Health Insurance	Medicare		Medicaid and CHIP		ESI Plus Fungible Value of Medicare, Medicaid, and CHIP
		Average Cost	Fungible Value	Average Cost	Fungible Value	
1979						
Lowest Quintile	1.0	10.7	7.1	4.9	2.1	10.1
Second Quintile	4.1	2.7	2.6	0.8	0.8	7.4
Middle Quintile	4.1	1.0	0.9	0.2	0.2	5.2
Fourth Quintile	3.7	0.5	0.5	0.1	0.1	4.3
80th–90th Percentiles	3.3	0.4	0.3	0	0	3.7
90th–95th Percentiles	2.9	0.3	0.3	0	0	3.2
95th–99th Percentiles	1.8	0.3	0.3	0	0	2.2
Top 1 Percent	0.5	0.2	0.2	0	0	0.7
All Quintiles	3.1	1.6	1.3	0.6	0.3	4.7
2007						
Lowest Quintile	1.4	29.1	14.1	20.9	3.2	18.6
Second Quintile	6.3	12.5	11.5	5.8	3.3	21.0
Middle Quintile	6.9	4.8	4.7	1.6	1.0	12.6
Fourth Quintile	6.4	2.1	2.1	0.6	0.4	8.8
80th–90th Percentiles	5.4	1.3	1.3	0.3	0.2	6.9
90th–95th Percentiles	4.3	1.0	1.0	0.2	0.1	5.4
95th–99th Percentiles	2.6	0.8	0.8	0.1	0.1	3.5
Top 1 Percent	0.5	0.2	0.2	0	0	0.6
All Quintiles	4.3	4.3	3.2	2.2	0.7	8.1

Source: Congressional Budget Office.

Notes: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes, see "Notes and Definitions" at the beginning of this study.

CHIP = Children's Health Insurance Program; ESI = employer-sponsored health insurance.

when measuring Medicaid and CHIP benefits by their fungible value, the distribution of benefits is somewhat less skewed, with the lowest two income quintiles each receiving more than 30 percent of the benefits in 2007.

Compared with Medicaid and CHIP benefits, the distribution of Medicare benefits is not as concentrated in the lower part of the income distribution, but it still tilts notably in that direction. Although Medicare is not means-tested, most beneficiaries are elderly, which is a group with below-average income. In 2007, when measuring Medicare benefits by their average cost, the lowest quintile received about 46 percent of those benefits. As

with Medicaid and CHIP, using the fungible value rather than the average cost reduces the impact of the program at the lower end of the income scale. When measuring Medicare benefits by their fungible value, the lowest quintile received about 30 percent of the benefits in 2007.

From 1979 to 2007, total spending on Medicare, Medicaid, and CHIP grew rapidly, so the increment to households' incomes from the programs grew rapidly as well. When valued at average cost, Medicare benefits rose from 1.6 percent to 4.3 percent of market income over

Figure C-1.

Effect of Health Insurance on Income Inequality Measures

(Gini index)
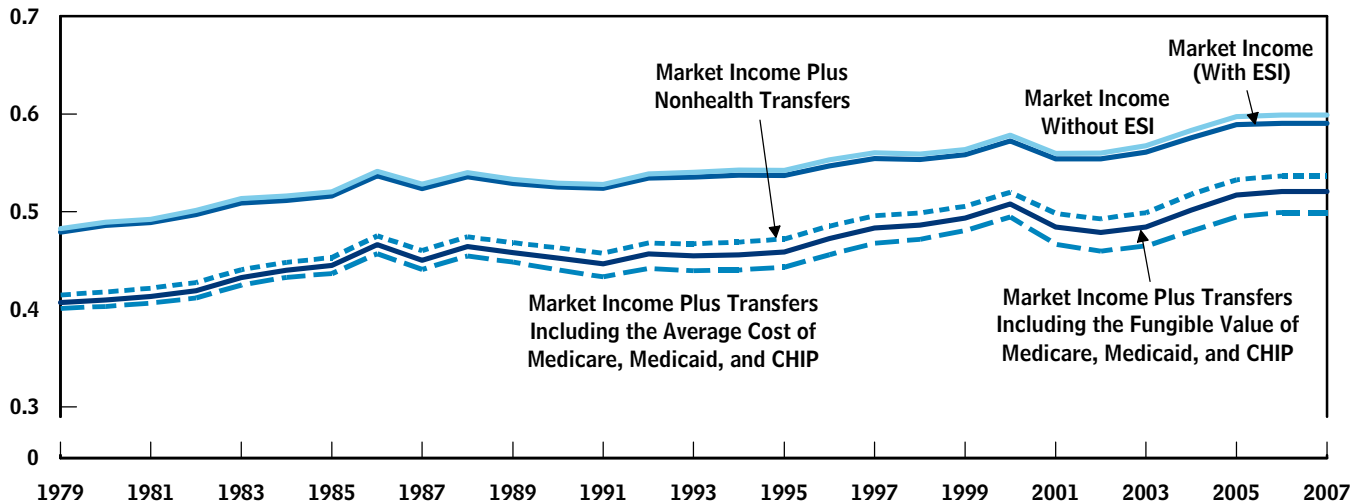
Source: Congressional Budget Office.

Notes: For information on income definitions, the ranking of households, the allocation of taxes, and the construction of inequality indexes,
        see ''Notes and Definitions'' at the beginning of this study.

        ESI = employer-sponsored health insurance; CHIP = Children's Health Insurance Program.

that period, while Medicaid and CHIP benefits rose from 0.6 percent to 2.2 percent. The fungible value of Medicare, Medicaid, and CHIP benefits did not grow nearly as rapidly as the average cost of those programs, but it still grew more rapidly than market income. Between 1979 and 2007, the fungible value of Medicare benefits increased from 1.3 percent to 3.2 percent of market income, and the fungible value of Medicaid and CHIP benefits increased from 0.3 percent to 0.7 percent. The growth of those programs relative to market income increased the redistributive effect of those programs. But the programs became less concentrated in the bottom of the distribution (whether measured by insurance value or fungible value), which partially offset that increase in the redistributive effect.

Including Medicare, Medicaid, and CHIP benefits in income lowers the measured Gini index (see Figure C-1). In 1979, the Gini index for market income plus transfers including the fungible value of Medicare and Medicaid benefits was 0.407, compared with the Gini index for market income plus transfers apart from Medicare, Medicaid, and CHIP of 0.415—a reduction of about 2 percent. Including benefits from those programs at their average cost would further lower the Gini index to 0.401. In 2007, including the fungible value of Medicare, Medicaid, and CHIP benefits reduced the Gini index by 3 percent, from 0.537 to 0.521. Including the average cost instead would have decreased the Gini index further, to 0.499.